REPORT OF CONSTRUCTION PLANT AND MACHINERY COMMITTEE 1972

VOL. II (APPENDICES)



GOVERNMENT OF INDIA
MINISTRY OF IRRIGATION & POWER
NEW DELHI

REPORT OF CONSTRUCTION PLANT AND MACHINERY COMMITTEE 1972

VOL. II (APPENDICES)

CONTENTS

Chapte No.	r Appendi No.	x Particulars	Reference in the Chap Para/Page
1	2	3	4
Intro- duction		Recommendations of the previous C.P.M.C. Memo, constituting this C.P.M.C.	3 1 4 2
1	1.1	Equipment available with different Sectors	1.2.1.
	1.2	Census of equipment as supplied by dealers of equipment .	1.2.2.
	1.3	Equipment with State Govts, including I & P Sector	1.3.
	1.3.1	State-wise census/value of equipment	1.3.
	1.4	Equipment with Central Govt. Deptts, including I & P Projects	1.3. 11
	1.5	Equipment with Govt. Undertakings/Corporations	1.3. 12
	1.6	Equipment with private bodies	1.3. 13
	1.7	Equipment in 1 & P Sector only	1.3. 14
	1.8	Census/value of indigenous items of equipment	1.6.2. 15
	1.9	Indigenous manufacturers of major categories of equipment	1.6.3. 16
	1.10	Future programme of manufacture of heavy earthmoving equipment	1.6.4. 17
	1.11	Yearwise census; value of equipment	1.2.5. 18
	1.12	Category-wise population & value of equipment in the country	1.8.1. 19
2	2.1	Average utilisation of major categories of equipment from the date of initial commissioning to end of 1970 and during the last 5 yrs., in respect of selected projects in different sectors.	2.5.3. 21
	2.2.1	Equipment utilisation (Excavators)	2.5.4. 24
	2.2.2	De. (Cr. Tractors)	2.5.4. 27
	2.2.3	Do. (Dumpers)	2.5.4. 31
	2.2.4	Do. (Motorised Scrapers)	2.5.4, 34
	2.2.5	Do. (Cranes)	2.5.4. 35
	2.3	Comparison of the capital investment and the end cost of works by operating machines	2.4.5.2. 37
	2.4	Identification of stand by components for 10 Nos. D-8 power Shift tractors	2.3.7. 40
4	4.1	Value of stock (spare parts) receipts, issue and balances	4.2.1. 41
•	4.2	Organisational set up with some users of equipment	4.4.6. 43
	4.3	Use of Kardex Card for Inventory controls	4.6.3.2. 46
	4.4	Kardex record for protective items	4.6.3.7. 50
5	5.1	Extract of requirements during the Fifth Plan	
6	6.1	List of members constituting the Standing Committee of experts on standardisation of equipment	
7	7.1	Statement showing the number of trainees passed out from the CW & PCTechnical Training Centres -from the year 1956 onwards	1
	7.2	Service training programme as organised by B.E.M.L	7.3.3. 69
	7.3.1	Equipment and facilities for Training of Operators & Mechanics on Shovels and Dumpers	7.7.1. 71
	7.3.2	Equipment & facilities for Training of Operators & Mechanics in Technical Training Centres	
	7.4.1	Cost of training of Operators	7.7.1. 72
	7.4.2	Cost of training of Mechanics	7.7.1. 73
	7.5	Hustrative excercise on evaluating of benefits to be derived from training	7.7.3. 73
8	8.1	Technical delects noticed in items of equipment of different makes and of different countries of origin	8.2.7. 74

Chapte No.	r Append No		Reference in the Ch Para / Pa	apter
1	2	3		4
8	8.2	Statement of maximum No. of hours of operation of machines and the corresponding Nos of years the machines have been in use		70
	8.3	Life of equipment as adopted by various users in hours and years	8.3.7.1. 8.3.7.3.	78 83
	8.4	Life of equipment, depreciation per centage and the repair provision		86
	8.5	Repair expenditures on major items of equipment for the last 5 yrs as intimated by	0.5.0.	00
		some of the projects	8.4.2.	93
	8.6	Graph showing a comparison of repair expenditures with different users and the recommended provision	8.4.2.	99
	8.7	Repair provision (Major & Field Repairs combined) with average operating conditions	8.4.3.	112
	8.8	Multiplying factor to the Purchase Cost for estimating repair provision during the life time of Equipment at different operating conditions	8.4.3.	117
	8.9	Identification of machine applications for classifiying the job conditions as light, medium and severe	8.4.3.	117
	8.10	Estimated man-hours required for complete over-hauls of equipment and components .	8.4.5.	119
	8.11	Average man-hours required for rebuilding of worn out track components	8.4.5.	120
	8.12	Tyre life	8.4.6.2.	122
9	9.1	Summary of information received from various Departments/Projects on the Rate Structure of Hire Charges of Earthmoving and Construction Equipment	9.5.1.	123
	9.2	Life of the equipment and the estimated ownership cost	.9.6.4.3	128
	9.3.1	Daily report of the Operation of Equipment given on Hire	9.7.5.	130
	9.3.2	Daily report of repairs carried out to the equipment given on hire	9.7.5.	130
	9.3.3	Daily Maintenance Report	9.7.5.	131
10	10.1	Preventive Maintenance	10.10.4.	132
	10.2	History Book	10.10.8.	137
11	11.1	Typical workshop layout for repair facilities for 200 machines	11.4.3.	145
	11.2	A suggested spare parts stores for earth-moving equipment	11.5.	146
12	12.1	Items of work to be performed by C.M.U. as recommended by the Committee of Ministers	12.1.5.	152
	12.2	Questionnaire as issued and state-wise replies received regarding the position of C.M.U.	12.2	152
	12.3	Note on proceedings of the C.P.M. Committee in Orissa State	12.2.2.	157
	12.4		12.3.3.	
	12.5	Proposed organisational set up of a C.M.U. in a State	12.3.3.	158
				161
13	13.1		13.3.4.5.	
	13.2	Set of proformae for record keeping	13.6.2.	163
	13.3		13.6.2.1.	
	13.4		13.8.5.	170
	13.5	P.W.A. Form No. 16 Register of manufacture—A typical extract from Beas Project Accounts	13.8.1.5	175
	13.6	Typical annual estimates for ownership and operating cost in respect of (i) Bottom Dumpers, (ii) Excavators, Electric-7 Cyds., based on 'Declining Balance Method of Depreciation'—prepared by Beas Project	13.8.3.1.	177
	13.7	Monthly cost abstract	13.8.3.4.	180
	13.8	Record of information on spare parts for Annual accounting	13.9	181
	13.9	Table worked out to indicate the year wise investment cost, depreciation, residual value, average investment and interest charges at 20% declining balance depreciations rate and 10% interest rate	13.4 1	182

Chapter No.	Append No.	ix Particulars		Reference in the Cha Para / Par	pter
1	2	3		4	
14	14.1	Organisational set up with some major users of equipment		14.5	184
	14.2	Proposed organisation for projects using equipment worth Rs. 100 to 150 million one location	at	14.6.4.	189
	14.3	Incentive Bonus Schemes in I & P Projects		14.8.12.	190
	14.4	Supervisors' & Executive Training Scheme		14.7.3.	197
	14.5	Suggestions received from Universities/Engineering Colleges—Abstracts of	•	14.7.4.	197



RECOMMENDATIONS OF THE PREVIOUS CONSTRUCTION PLANT AND MACHINERY COMMITTEE

- 1. Construction plant should be planned and detailed with the same care as is essential for working out other details of a project. It should be based on carefully collected data regarding materials, progress schedules and specifications.
- 2. Planning should take into account the job set up and should aim at utilising about 75% of the life of the capital equipment against a definite programme for utilisation.
- 3. The "job factor" and the "management factor" should be properly evaluated in as far as this affects costs and production. The master plan of equipment should bring about all these points and their effects on cost and production.
- 4. Small sizes of equipment are not recommended for use on projects except in as far as they may be required to aid the manual work.
- 5. The policy of purchase of capital equipment should be coodinated with the overall plans of the project engineer to fit his organisation and job requirements.
- 6. For large earth dams, mechanisation is essential for economy and to meet the production targets. Canal excavation has a greater scope for employing manual labour. Judicious use of equipment to assist the manual work is advocated.
- 7. Yearly financial grants should be arranged in such a way as to avoid piecemeal purchase of equipment causing the introduction of non-standardised equipment.
- 8. The quotations for the purchase of equipment must be weighed with due regard to services which the firm can offer in ex-stock supply of spares and technical assistance.
- 9. Multi-shift working should be a standard feature and suitable allowance or extra pay should be given to the project staff for shouldering the additional responsibility of multishift working and cost control.
- 10. Proper facilities for ancillary sevices, e. g., flood-light, railroad, labour amenities, transport for supervisory personal, communication, etc., should be incorporated in the plan as the efficiency of the equipment operation will depend upon such services.
- 11. Careful layout for standardisation of lubricants is recommended. Importance of clean fuel for efficient operation is brought out. Filtered oil can be used for less exacting duties to keep down costs.
- 12. Incentive wage for production in excess of standards of operation and maintenance should be a regular features of wage structure.
- 13. Adequate amenities should be offered to the operation and maintenance personnel to enable them to do their duties efficiently and safely, e. g., providing uniforms, warm overalls, goggles, etc.
- 14. The training programme under consideration by C.W.& P.C. must be implemented as soon as possible under a new Directorate of Technical Man power.
- 15. Mode of calculation of the working cost of each type of plant per hour; the unit cost of the work performed by each ype of plant on the various projects should be computed for the last working season and variations in cost should be explained t
- 16. Suggestions for a unified scale of depreciation to be followed of all river valley projects.
- 17. The "plant hour" is defined as "meter hours" where meters are working where such meters do not exist, commensurate effective hours, based on the working of similar other machines with meters, should be used.
- 18. The expenditure on the purchase of earthmoving machinery should be accounted for as suspense charges and charged off progressively to works through depreciation.
- 19. A flat rate of levy is proposed for Major Repairs to equipment, which should be credited to a Reserve Fund and the charges for Major Repairs watched through suspense estimates, should be debited to the fund.
- 20. The operating charges should be watched through suspense estimates and cleared monthly by debit to the work to which services are rendered.
- 21. The Log Book should be used as a primary record of operational data and the History Books should give all the technical and cost data of a machine for technical and fiscal evaluation.
- 22. Project should be allowed to order their spare parts requirements either against D.G.S. & D. rate contracts or under normal procedures of tenders. Attention of the Stores Purchase Committee should be drawn to the necessity of obtaining spare parts and other materials expeditiously by the projects by delegating adequate powers to the project officers.
- Organisation of the store should be such as can render quick service to the project.

- 24. A Central Organisation under C.W. & P.C. to coordinate the demand for equipment following its release from completed projects is suggested.
- 25. A Central Scaling Organisation under C.W. & P.C. to assist the projects to forecast their demands of spare parts and to build up stocks of only useful items is suggested.
- 26. Organisations are suggested to be set up for (i) Machinery Exchange, spare parts coordination and scaling of forward requirements of spares, (ii) Technical Man Power Organisation to pool and utilise the available resources of skilled personnel for effective utilisation on projects and (iii) Cost accounting organisation to assist the projects to utilise modern methods of cost and production control and to act as a watch of the Government of India, working on definite and detailed figures.

APPENDIX 0.2

No. 6(5)/69-Policy/Mat.

GOVERNMENT OF INDIA

Ministry of Irrigation and power

New Delhi, the 31st October, 1970.

MEMORANDUM

Subject: —Appointment of a Committee to report on construction plant and Machinery used in various River Valley Projects in the country.

In October, 1953, the Governmentof In lia appointed a committee of engineers to visit some of the projects then under execution, and submit its report on the economic and efficient operation and maintenance of the plant and machinery used in the construction work of River Valley Projects in the country. The Committee its report in February, 1954. Since then, a good deal of equipment has been imported but satisfactory utilisation thereof has been hampered for want of spares etc. It is considered necessary to take stock of the position in regard to the equipment available in the country and its optimum utilisation. The Government of India have, therefore, decided to set up a Committee, with the following composition, for carrying out the study in detail after visits to some of the important projects and establishments:—

1. Shri S.P. Chugh, (at present Director (P & M), CW & PC) Chairman

 Shri Jagman Singh, Superintending Engineer, Mechanical Circle. Beas Project, Unit-II, Talwara. Member (Part-time)

 Shri Gopala Rao, Superintending Engineer, Nagarjunasagar Dam Project Andhra Pradesh. Member (Part-time)

4. Shri J.N. Srivastava, Director)D II), CW & PC (WW)

Member (Part-time)

 Shri M.C. Praharaj, Deputy Director (P & M), C.W.& P.C. (Water Wing).

- Member-Secretary
- 2. If necessary, the Committee may co-opt members from other interested organisations like National Coal Development Corporation, National Minerals Development Corporation, Hindustan Steel etc. The Committee will be provided necessary supporting staff.

सत्यमेव जयत

- 3. The terms of reference of the Committee will be as follows:
 - (i) Appraisal of the Construction Plant and Equipment in the country;
 - (ii) Assessment regarding level of utilisation of available equipment;
 - (iii) Reasons for low utilisation of equipment and low efficiency in operation;
 - (iv) Procedure, System and methods of procurement of spare parts and inventory control;
 - (v) Remedial measures necessary for improving efficiency in the operation of equipment and for optimum utilisation thereof:
 - (vi) Requirements of equipment in the Fourth Five Year Plan, import substitution and standardisation;
 - (vii) Inter-departmental co-ordination in matters relating to Construction Plant and Equipment with emphasis on inter-departmental transfer of surplus equipment;
 - (viii) Training of operators and mechanics—Review of adequacy of present arrangements etc.

- (ix) Data on performance of different items of equipment of various categories/makes;
 - (a) Technical assessment;
 - (b) Norms for schedules of working hours and life of equipment of various items;
 - (c) Actual performance of various items of equipment in different projects in various sectors in terms of average annual utilisation and the life usefully spent on different jobs over given periods;
 - (d) Major repairs and field repairs. Charges over the last ten years, in respect of various items of equipment in terms of
 - (1) Spare parts; and
 - (2) Labour,
- (x) Hire Charges of equipment;
- (xi) Maintenance procedures;
- (xii) Organisational set-up, including workshop facilities stores and warehouses etc.;
- (xiii) Organisation and functioning of Ceatral Mechanical Units in Irrigation and Power Sector and similar other establishments in other sectors;
- (xiv) Accounting for the ownership and operating cost per plant hour;
- (xv) Recommendations for management, operation and utilisation of construction plant and equipment.
- 4. The expenditure on T.A. and D.A. in respect of Sarvashri Jagman Singh and Gopala Rao will be met by the Central Water and Power Commission (Water Wing) from out of their budget grant.
- 5. The Committee will submit its report as early as possible but in any case within a period of one year.

Sd/—A.F. Couto Director (F.E. & P.)

To

- 1. Shri S.P. Chugh, Director (P & M), CW & PC (Water Wing), New Defhi.
- 2. Shri Jagman Singh, Superintending Engineer, Mechanical Circle, Beas Project, Unit-II, Talwara
- 3. Shri Gopala Rao, Superintending Engineer, Nagarjunasagar Dam Project, Andhra Pradesh.
- 4. Shri, J.N. Srivastava, Director (D-II).C.W. & P.C. (Water Wing), New Delhi.
- 5. Shri M.C Praharaj, Deputy Director (P&M), C.W. & P.C. (Water Wing), New Defhi.
- 6. The Chairman, Central Water and Power Commission (Water Wing), New Delhi.
- 7. The Accounts Officer, C.W. & P.C. (Water Wing), New Delhi.
- 8. The General Manager, Beas Project, Talwara.
- 9. The Secretary to the Government of Andhra Pradesh, Public Works Department, Projects Wing, Hyderabad-4 with reference to his letter No. 3438-A 1/70-2 dated 21-9-70.
- 10. The Ministry of Finance (Department of Expenditure, I &P. Branch), New Delhi.
- 11 U.S. (E), Ministry of Irrigation & Power.
- 12. Adm.I/Adm. IV Sections, Ministry of I. &. P.
- 13. Budget/Internal Finance Sections, Ministry of Irrigation & power.

Copy also to :--

- 1. P. S. to Minister for I. &. P.
- 2. P. S. to Deputy Minister for J.&.P.
- 3. P. S. to Secretary, Ministry of I.&.P.
- 4. Editor, Bhagirath.
- 5. Information Officer, Ministry of Irrigation and Power.

No. 6(5)/69-Policy/Mat.

GOVERNMENT OF INDIA

Ministry of Irrigation and Power

New Delhi, the 19th January, 1971.

MEMORANDUM

Subject: - Appointment of a Committee to report on Construction Plant and Machinery used in various projects in the country.

The undersigned is directed to refer to this Ministry's Memorandum of even number dated the 31st October, 1970 on the subject mentioned above and to say that it has, now been decided to appoint Shri B. Kotaiah, Superintending Engineer (Mechanical) Public Works Department, Andhra Pradesh, Hyderabad as a Part-time member of the above mentioned Committee in place of Shri Gopala Rao, who is being appointed as Chief Engineer of the Salal H.E. Project.

2. The expenditure on T.A. and D.A. in respect of Shri Kotaiah will be met by the Central Water and Power Commission (Water Wing) from out of their grant.

Sd/- A.F.Couto. Director (F. E. & P)



APPENDIX 1.1

STATEMENT SHOWING EQUIPMENT AVAILABLE WITH DIFFERENT SECTORS

SI. Sector	ĭ	Total No. Total Value	Total Value		Break ut	of Column 3	1 & 4 accordin	g to conditio	Break up of Column 3 & 4 according to condition of machines		
		or machines		Working Condition	c .	Under Repairs	er airs	Beyond economical Repairs	d cal 's	Surplus	
			İ	Nos.	Value	Nos.	Value	Nos.	Value	Nos.	Value
1 2		3	4	ः । • ऽ व जः	9	7	oc.	6	10	11	12
1. Central Govt.	•	3,788	4,455.72	2,440	3,013.37	11.6	1.120.69	377	321.66	109	45.52
2. State Govt	•	7,542	13,271.38	4,617	9,397.77	2,016	3,157.07	606	716.54	1,608	1,438.21
3. Govt. Corporations/Undertakings .	ns/Undertakings .	2,897	8,778.73	2,253	7,722.58	522	884.95	122	171.20	368	269.67
4. Private Bodies	•	1,438	2,651.79	1,175	2,263.93	218	321.04	45	66.82	56	84.74
Total		15.665	29,157.62	10,485	22.397.65	3,727	5,483.75	1.453	1,276.22	2.141	2,138.14

APPENDIX 1.2 CENSUS OF EQUIPMENT AS SUPPLIED BY THE DEALERS OF EQUIPMENT

S. No.	Category of	Equ	ipmen	t										Tota Nos.
1.	Excavators & Cranes	•		•	•	•	•		•	•	•		*	176
2.	Tractors:													
	i) Crawler						•							5233
	ii) Wheeled		•											147
3.	Dumpers	• ,					•							3203
4.	Scrapers (Motorised) .		•	•				•						966
5.	Motor Graders .		•		•	•								288
6.	Front End Loaders: (i) Crawler (ii) Wheeled													113 114
7.	Crushing, Screening & Proces	ssing	Plant	s .	•									198
8.	Tractor Trailors					•.								43
9.	Mobile Workshops .				500	es)								. 26
0.	Compressors			É	File		à.		•		٠			3500
1.	Drills/Drilling Equipment			J.								•		371
2.	Pile Driving Equipment	•		16			9						,	35
3.	Water Tankers & Sprinklers				VA i		1							3
4.	Fork Lifts			ď		JAN.	70					_	ē	56
	Batching & Processing Plants			-	Y.	ارد			•			•		17
					uzni	व जग	ने	Ţ	OTAL			•		16080

(Value in Rs. lakhs.)

STATEMENT SHOWING THE EQUIPMENT WITH STATE GOVERNMENTS INCLUDING

I. & P. PROJECTS

430.87 32.85 366.50 31.56 141.24 34.01 20.95 6.27 46.34 0.0 30.45 8.26 11.78 4.10 30.00 0.87 0.85 1.76 1,438.21 Value 2 Surplus 1.68 8 11 78 71 7 7 15 7 . 38 9 ع د د = Ź Value 227.71 25.57 28.62 288.64 91.87 17.92 15.78 2.67 .. 6.92 3.8 0.73 0.18 0.85 1.76 716.54 9 Beyond Economical Repairs Break up of Columns 3 & 4 according to condition of machine Zos. 85 5 8 8 8 8 13 30 .069.35 72.53 731.50 537.71 0.05 44.02 2.67 0.87 61.76 43.42 10.94 10.98 8.75 3,157.07 18.9 0.63 Value 00 Under Repairs 2,016 84 8 8 8 x x Nos. 1 36 30 9 33 52 52 2,349.26 87.94 94.16 103.06 58.97 87.88 587.16 2.67 71.79 5.06 70.08 10.34 2,239.87 1.286.77 100.95 179.93 167.90 76.61 4.1 9,397.77 1,652.33 9 Value Working Condition 4,617 303 468 155 107 43 241 80 9 34 Ξ 4 Zes. 102.65 104.35 652.10 101.00 230.27 3,646.32 Total Nos. Total Value 1.916.35 213.92 107.80 71.79 4.96 69.02 180.60 87.55 5.34 5.93 19.09 14.88 3.90 2,085.06 3,260.01 13,271.38 ,432 284 23 23 23 5 7.542 " & aggregate (i) Front End Loaders (Crawler) (ii) Front End Loaders (Wheeled) Drills & Drilling Equipment Water tankers & Sprinklers Air Compressors (all types) Muckers & Rocker shovels Category of Equipment Batching & Mixing Plant Crushing Screening Processing Plants Excavators . (including Dredgers) Mobile Workshop. (ii) Tractors (W). Cranes (all types). Vibratory rollers . Ditchers Trenchers Mine Car Loaders (i) Scrapers (M)
(ii) Scrapers (T) Motor Graders Tractor Trailers Belt Conveyors (i) Tractors (C) Agitating Cars Cableways . Fork lifts . Locomotives Dumpers TOFAL S.S. 15. 16. 17. 18. 19. 20. 22. 23. 6 ૹ૽ 10. 17 ~ 4

(Value in Rs. lakhs).

STATEMENT SHOWING STATEWISE CENSUS/VALUE OF EQUIPMENT

Value 708.90 67.83 129.53 111.39 5.60 270.57 18.02 90.75 1.72 0.40 3.71 H.P. Nos. 13 222 8 173.03 Value 34.39 3.08 9.15 . 68 7 Haryana Nos. Ξ 134 : 2 σ Value 1,160.43 242.33 6.90 309.99 6.42 40.49 36.09 1.26 55.20 : 2 0.38 0.51 16.65 15.97 2 Gujarat 376 Nos. 116 6 Value 73.674 216.32 5.63 5.68 2.58 9.23 0.50180.35 5.71 16.52 œ Bihar Nos. 28 97 97 26 7 7 317 4 Value 6.50 20.70 9 Assam S Nos. 43 56 1,683.65 Value 239.86 481.69 0.8920.75 30.00 16.36 31.21 1.92 31.24 19.88 11.01 4 A.P. 1.010 54 282 61 165 191 : = 3 23 84 Nos. Crushing, Screening & Aggregate Excavators (including Dredgers). Air Compressors (All Types) Drills & Drilling Equipment Muckers & Rocker Shovels (i) Front End Loaders (Cr.) . Batching and Mixing Plants Category of Equipment (ii) Frent End Loaders (Wh.) Cranes (All Types) . N Vibratory Rollers Processing Plants (ii) Tractors (Wh.) Tractor Trailors (i) Tractors (Cr.) . (ii) Scrapers (T) . Motor Graders Belt Conveyors Locomotives . (i) Scrapers (M) Cable Ways Dumpers SI. No. 9 " 7. 8. 9. 10. 14. 15. 16. 17. 18. 5.5

SI. No.	o. Category of Equipment	J.	& K.	×	Kerala	M.P.	•	Ma	Maharashtra		Mysore	0	Orissa
		Nos.	Value	Nos.	Value	Nos.	Value	Nos.	Value	Nos.	Value	Nos.	Value
-	2	15	16	17	18	19	20	21	22	23	24	25	26
1.	Excavators (including Dredgers).	∞ .	55.16	10	30.98	41	60.30	1.1	108.56	15	55.30	26	164.64
	(i) Tractors (Cr.)	17	40.68	18	20.92	238	245.19	. 218	603.88	136	269.99	237	256.61
<u>:</u>	(ii) Tractors (Wh.).	:	:	7	0.20	18	11.34	82	5.52	23	13.16	14	16.30
Э,	Dumpers	40	55.11	99	56.13	86	164.96	130	309.89	84	186.41	203	503.34
4.	4. (i) Scrapers (M)	3	6.59	4	7.84	130	202.90	89	170.62	83	239.44	19	16.12
Ë	(ii) Scrapers (T)	2	08.0	2	0.26	25	17.42	œ	4.80	1	0.52	20	4.07
۶.	Motor Graders	7	2.00		0.84	37	28.49	20	31.11	6	12.05	20	15.31
6. (i	(i) Front End Loaders (Cr.) .	1	1.25	U	é	61	2.66	39	50.76	4	4.78	10	23.24
i)	(ii) Front End Loaders (Wh.)	;	:	s सन्य	8.66		A STATE	7	0.33	7	2.06	:	•
7.	Cranes (All Types)	7	3.93	78	89.87	80	11.78	20	30.51	13	21.59	12	19.81
∞ਂ	Air Compressors (All Types)	13	5.26	30	5.24	4	1.85	74	23.11	38	13.24	11	3.52
.6	Drills & Drilling Equipment	:	:	45	3.82	9	1.33	54	24.94	2	1.35	ī	0.29
10.	Crushing, Screening and Aggregate Processing Plants	6	0.36	:	:	:	:	136	45.07	∞	2.06	21	10.56
11.	Locomotives	:	:	:	:	:	:	7	2.85	-	0.18	:	:
12.	Cable Ways	:	:	7	8.47	;	;	:	:	:	:	•	:
13.	Belt Conveyors	:	:	:	:	:	:	N	0.28	:	:	:	:
14.	Tractor Trailors	:	:	:	:	9	9.23	:	:	33	12.13	27	1.97
15.	Mobile Workshops	-	1.00	•	:	:	:	:	:	:	:	:	:
16.	Fork Lifts	:	:	:	:	33	1.96	•	:	:	•:	:	:
17.	Ditchers/Trenchers	:	;	:	:	1004	1.29	:	:	:	:	9	1.20
18.	Mine Car Loaders	:	:	3	0.18	:	:	:	:	-	0.11	:	:
	Total .	16	172.14	217	233.41	290	760.70	818	1,442.23	453	834.37	627	1,056.98

APPENDIX 1.3.1—Contd.

SINO	O. Category of Equipment	Div	Dunish	Danie	Dairethan	Tam	Tamil Nadu	UP		West Bengal	engal	Total of	Total of all States
•		In I	gao	Kaj	tstilan	Itali	I Marie		-			1	Volue
		Nos.	Value	Nos.	Value	Nos.	Value	Nos.	Value	Nos.	Value	Nos.	٨ تاريد
-	2	27	28	29	30	31	32	33	34	35	36	37	38
-:	Excavators (including Dredgers)	79	459.66	23	163.16	3	6.63	34	214.22	17	48.74	408	2,085.06
2. (6	(i) Tractors (Cr.)	116	208.52	314	176.24	30	57.02	255	514.62	54	54.94	2,310	3,646.32
€	(ii) Tractors (Wh.).	ব	15.86	45	5.88	:	:	57	98.19	19	27.25	303	186.04
ů,	Dumpers	179	571.38	. 4	0.13	31	15.03	144	407.43	20	19.27	1,432	3,260.01
. 4 (j	(i) Scrapers (M)	3	1.93	∞	15.06	9	86.42	112	188.05	40	118.82	804	,,916.35
ij	(ii) Scrapers (T)	:	:	119	69.82	:	:	16	7.37	9	68.0	222	118.89
5.	Motor Graders	12	10.19	20	6.03	:	:	18	16.00	7	5.04	211	180.60
6. (i	(i) Front End Loaders (Cr.)	;	:	m	5.34	:	:	:	:	4	3.28	69	102.65
Ë	(ii) Front End Loaders (Wh.)	2	3.58	14		Con Control	£.	9	9.22	7	1.24	57	104.35
7.	Cranes (All Types)	10	17.35	9	4.53	25	81.22	34	146.81	∞	83.91	215	652.10
				पेव			2.0						12,252.37
∞	Batching and Mixing Plants .	3	8.33	ज			37	:	:	:	:	∞	101.00
6.	Air Compressors (All Types)	22	16.08	23	11.90	52	68.9	123	49.75	52	15.00	64 4	230.27
10.	Drills & Drilling Equipment	17	5.35		Ą.		<u>_</u>	11	124.27		0.20	284	213.92
Ξ.	Crushing, Screening and Aggre-	,	ć	•		į	i c	,	9	-	01.0	250	107 80
12.	Locomotivas	o -	20.21	-	0.15	15 :	7.57	7	€.	_ ~	2 5	ş %	87.55
13.	Agitating Care	-	0.17	:	:	7.	10.74	: •		n	3	१ च	4. 2
4	Cable Warre	: •	: 6	:	:	:	:	4	5.34	:	:	۲ ح	71.70
15.	Belt Conveyors	٦	55.32	:	:	:	:	:	:	:	:	+ 1-	5.93
16.	Tractors Trailors	: "		: =		: -	. 40	: ;	12 95	:	:	162	81.22
17.	Vibratory Rollers	,	2	5	3		÷:	7 2	17.41	: m	0.90	23	19.09
18.	Mobile Workshops	:	: :	∞	2.76	: :	: :	, ,,,,, ,	1.20	:	:	10	4.96
19.	Water Tankers and Sprinklers .	:	:	:	:	:	:	ς.	14.88	:	:	\$	14.88
2 0.	Muckers & Rocker Shovels .	-	1.19	:	:	:	:	:	:	:	:	19	69.03
21.	Fork Lifts	:	:	:	:	:	:	1	0.68	:	:	9	3.90
22.	Ditchers/Trenchers	:	:	16	0.56	:	:	:	:	:	:	23	3.05
23.	Mine Car Loaders	:	•	:	:	:	:	:	:	:	•	4	0.29
	TOTAL	456	1,379.40	619	469.22	209	286.81	923	1,792.46	237	380.21	7,542	7,542 13,271.38
1	***************************************												

APPENDIX 1.4

STATEMENT SHOWING EQUIPMENT WITH CENTRAL GOVT, DEPARTMENTS INCLUDING I & P. PROJECTS

(Value in Rs. Lakhs)

1	S. No.	Category of Equipment	Total Nos.	Total Value	Working	Working Condition Under Repairs Beyond Economical St. Repairs	Under	Under Repairs	Beyond Ecc Repairs	Beyond Economical Repairs	Surplus	sn
Excavators (including Dreigers)					Nos.	Value	Nos.	Value	Nos.	Value	Nos.	Value
(ii) Tractors (friedluding Dreudgers)	-	2	3	4	5	9	7	8	6	10	=	12
(ii) Tractors (Cr.)	- -	Excavators (including Dredgers)	123	370.56	111	343.41	10	24.86	71	2.29	9	5.16
(ii) Tractors (Wh.)) Tractors (Cr.)	1,405	2,201.15		1,375.00	375	554.13	265	272.02	9	2.97
(ii) Scrapers (M)	(E)	Tractors (Wh.)	192	87.17	180	73.86	6	86.6	e n	3.33	3	3.33
(ii) Scrapers (M)	3.	Dumpers	48	53.56	11	10.05	32	43.32	ĸ	0.19	S	0.19
(ii) Scrapers (T)		Scrapers (M)	901	-	96	221.84	6	17.60	1	0.17	•	0.17
Motor Graders	(E)) Scrapers (T)	34	-Til	33	42.72	-	0.12	;	:	:	:
Front End-Loaders (Wh.)	5.	Motor Graders	125	- 30	98	82.18	30	26.21	6	9.11	7	1.47
Cannes (All Types)	9	Front End-Loaders (Wh.)	32		9	4.89	23	16.99	3	2.22	2	2.22
Air Compressors (All Types)	7.	Cranes (All Types)	06	223.52	83	214.34	9	9.16	1	0.02	2	0.14
Drillia & Drilling Equipment 24 10.32 24 10.32	∞:	Air Compressors (All Types)	897	570.68	499	186.18	317	354.93	81	29.57	81	29.57
Crushing Screening & Aggregate Processing Plants 448 188.32 312 135.35 130 50.40 6 2.57 Belt Conveyors • • • • • • • • • • • • • • • • • • •	9.	Drills & Drilling Equipment	24	10.32	24	10.32	:	:	:	:	:	:
Belt Conveyors 31 37.50 56 8.91 4 0.78	0.	Crushing Screening & Aggregate Processing Plants .	448	188.32	312	135.35	130	50.40	9	2.57	:	:
Tractor Trailors 31 37.50 29 35.39 2 2.11 <td>ij.</td> <td>Belt Conveyors</td> <td>09</td> <td>69.6</td> <td>99</td> <td>8.91</td> <td>4</td> <td>0.78</td> <td>:</td> <td>:</td> <td>:</td> <td>:</td>	ij.	Belt Conveyors	09	69.6	99	8.91	4	0.78	:	:	:	:
Vibratory Rollers	2.	Tractor Trailors	31	37.50	29	35.39	7	2.11	:	:	:	:
Mobile Workshops	eń.	Vibratory Rollers	S	08.0	1	0.17	е,	0.46	-	0.17	:	:
Water Tankers and Sprinklers 20 0.97 20 0.97	4.	Mobile Workshops	7	9.72	9	9.42	1	0.30	:	:	-	3.30
Pile Driving Equipment (including Vibrosinkers) . 53 55.19 39 49.31 14 5.88 .	5.	Water Tankers and Sprinklers	20		20	0.97	:	:	:	:	:	:
Tugs & Barges	9.	Pile Driving Equipment (including Vibrosinkers).	. 53		39	49.31	14	5.88	:	:	:	:
Asphalt Distributors & Paver Finisher	7.	Tugs & Barges	63	191.10	63	191.10	:	:	:	:	:	:
3788 4455.72 2440 3013.37 971 1220.69 377 321.66 109	∞	Asphalt Distributors & Paver Finisher	25	21.42	20	17.96	5	3.46	:	:	:	:
		Total	3788		2440	3013.37	176	1220.69	377		100	45.52

STATEMENT SHOWING THE EQUIPMENT WITH GOVT, CORPORATIONS/UNDERTAKINGS

(Value in Rs. lakhs)

No. Catagory of Equipment Total Total Total Nos. Working Condition Under Repairs Repairs Repairs Surplus Nos. Value Nos. Value									Break up	of Column	15 3 & 4 acc	ording to c	Break up of Columns 3 & 4 according to condition of machines	nachines	
Head of the control	S.No					Total	Total	Working	Condition	Under	Repairs	Beyond 1 Repairs	Sconomical	Sur	snlc
Exervators (including Dredgers) 3						Nos.	Value	Nos.	Value	Nos.	Value	Nos.	Value	Nos.	Value
(ii) Tractors (Cr.) Unmpers (Cr.)	-	2				3	4	S	9	7	8	6	01	11	12
(ii) Tractors (Cr.)	-	Excavators (including Dredgers)	•	•	•	202	3,023.14	176	2,868.76	70	135.43	9	18.95	14	49.32
(ii) Tractory (Wh.)		i) Tractors (Cr.)	•	•	•	559	1,024.53	388	773.53	156	221.31	15	29.69	36	107.39
Oumpers	۳	i) Tractors (Wh.)	•	•	•	162	70.07	106	45.85	47	21.01	6	3.21	52	21.87
(ii) Scrapers (M)	ĸ.	Dumpers	•	•	•	639	2,020.44	206	1,787.02	106	183.79	27	49.63	53	49.89
(ii) Scrapers (T)	4.	i) Scrapers (M)	•	•	٠	46	137.20	15	45.14	31	92.06	:	:	37	104.05
Motor Graders 17 31.73 18 25.82 8 5.34 1 0.57 7 (i) Front End Loaders (Cr.) 1 32.24 7 9.30 10 21.55 1 1.39 6 (ii) Front End Loaders (Wh.) 27 53.81 15 29.09 4 11.92 8 12.80 6 Cranes (All Types) 27 53.81 15 29.09 4 11.92 8 12.80 8 14 Batching & Mixing Plants 27 137.61 23 112.86 41 18.60 21 5.88 36 Drills & Drilling Equipment 28 422.09 180 40.40.33 5 1.91 4 15.28 36 Crushing, Screening and Aggregate processing Plants 9 46.40 5 13.87 4 11.80 1 5.00 2 Locomotives 3 20 99.15 3 98.87 4 11.80 3 11.1 <	Ü	i) Scrapers (T)	•	•	•	∞	6.52	7	6.10	-	0.42	:	:	:	:
(ii) Front End Loaders (Ct.)	ķ	Motor Graders	•	•	•	77	31.73	18	25.82	∞	5.34	1	0.57	7	5.08
(ii) Front End Loaders (Wh.)	<u>ت</u> و.	i) Front End Loaders (Cr.)	•	•	•	18	32.24	L	9.30	10	21.55		1.39	9	6.53
Cranes (All Types) 446 1,383.54 67 1,243.85 70 120.35 10 19.34 88 14 Batching & Mixing Plants	Ē	i) Front End Loaders (Wh.)	•	•	•	27	53.81	15	29.09	4	11.92	∞	12.80	∞	13.29
Batchling & Mixing Plants 1 2.00 1 2.00	7.	Cranes (All Types)	•	•	•	446	1,383.54	19	1,243.85	70	120.35	10	19.34	88	149.36
Air Compressors (All Types) 137.61 235 112.86 41 18.60 21 5.88 36 Drills & Drilling Equipment 189 422.09 180 404.93 5 1.91 4 15.25 5 1 Crushing. Screening and Aggregate processing Plants 9 46.40 5 13.87 4 32.53 3 2 Locomotives 20 99.15 20 99.15 <td>œ</td> <td>Batching & Mixing Plants</td> <td>•</td> <td>•</td> <td>•</td> <td></td> <td>2.00</td> <td>=</td> <td>2.00</td> <td>:</td> <td>:</td> <td>•</td> <td>:</td> <td>:</td> <td>;</td>	œ	Batching & Mixing Plants	•	•	•		2.00	=	2.00	:	:	•	:	:	;
Drills & Drilling Equipment		Air Compressors (All Types)	•	•	•	297	137.61	235	112.86	41	18.60	21	5.88	36	9.58
Crushing, Screening and Aggregate processing Plants . 9 46.40 5 13.87 4 32.53 3 2 Locomotives . .		Drills & Drilling Equipment	•	•	•	189	422.09	180	404.93	S	1.91	4	15.25	5	15.75
Locomotives 1	11.	Crushing, Screening and Aggregate pro-	cessin	g Pla	nts .	6	46.40	\$	13.87	4	32.53	:	:	e	27.53
Belt Conveyors	12.	Locomotives	•	•	٠	40	115.67	35	98.87	4	11.80	-	5.00	73	4.00
Tractor Trailors	13.	Belt Conveyors	•	•	•	20	99.15	20		:	:	:	:	:	:
Fork Lifts	14.	Tractor Trailors	•	•	•	100	29.47	93		7	1.19	:	:	11	1.63
Ditchers/Trenchers	15.	Fork Lifts	•	•	•	103	41.78	76	26.82	∞	5.74	19	9.22	10	5.00
Spreaders	16.	Ditchers/Trenchers	•	•	•	1	1.00	1	1.00	:	:	:	:	:	:
. 2,897 8,778.73 2,253 7,722.58 522 884.95 122 171.20 368	17.	Spreaders	•	•	•	8	100.34	3	100.34	:	:	:	:	:	:
		TOTAL			•	2,897	8,778.73	2,253	7,722.58	522	884.95	122	171.20	368	569.67

Appendix 1.6

(Value in Rs. lakhs)

STATEMENT SHOWING THE EQUIPMENT WITH PRIVATE BODIES

S, No.												
	o. Category of Equipment		Total Nos.	Total Value	Worki	Working Condition	Under	Under Repairs	Beyond Economical Repairs	onomical airs	Surplus	SI
					Nos.	Value	Nos.	Value	Nos.	Value	Nos.	Value
-	2		3	4	S	9	7	8	6	10	11	12
-	Excavators (including Dredgers)		110	605.06	102	583.18	∞	21.88	:	:	3	2.75
2.	2. (i) Tractors (Cr.)	•	134	295.84	95	213.73	37	78.89	2	3.22	6	9.70
į)	(ii) Tractors (Wh.)		37	19.59	32	18.35	S	1.24	:	:	:	•
3,	Dumpers		370	596.49	298	518.16	53	56.11	19	23.22	22	29.29
4.	(i) Scrapers (M)	٠	41	117.63	27	71.81	4	12.42	10	33.40	**	:
ij	(ii) Scrapers (T)		30	62.10	13	26.91	17	35.19	:	:	:	:
5.	Motor Graders		10	6.41	∞`	4.81	2	1.60	:	:	;	:
6. (i	6. (i) Front End Loaders (Cr.)		43	81.01	34	67.78	∞	11.94	-	1.29	4	3.82
Ξ,	(ii) Front End Loaders (Wh.)	•	99	140.43	53	117.48	11	20.05	7	2.90	;	:
٦.	Cranes (All Types)	•	108	274.55	84	214.51	24	59.87	:	:	∞	37.27
∞	Batching and Mixing Plants		7	43.67	7	43.67	:	:	:	:	,	:
6	Air Compressors (All Types)	•	201	96.65	171	86.87	24	8.94	9	1.84	7	0.52
10.	Drills & Drilling Equipment	•	84	85.27	69	80.24	11	4.11	4	0.92	7	0.27
11.	Crushing, Screening and Aggregate Processing Plants	its .	26	80.72	50	79.70	S	0.99	-	0.03	S	0.99
12.	Locomotives		33	37.87	32	37.20	_	0.67	:	:	:	:
13.	Belt Conveyors		15	12.30	15	12.30	:	;	:	:	:	:
14.	Tractor Trailors		29	41.10	64	40.66	т	0.44	:	:	1	0.13
15,	Muckers/Rocker Shovels		9	19.46	9	19.46	:	:	:	:	:	:
16.	Fork Lifts		17	16.41	14	13.71	æ	2.70	:	:	:	:
17.	Ditchers/Frenchers		7	4.00	;	•	71	4.00	:	:	:	:
18.	Ore Loading Plants		-	14.40	_	14.40	:	:	:	:	:	:
	TOTAL		1,438	2,651.79	1,175	2,263.93	218	321.04	45	66.82	56	84.74

APPENDIX 1.7

STATEMENT SHOWING CATEGORY-WISE EQUIPMENT IN IRRIGATION & POWER SECTOR

						Brea	Break up of Columns 3 & 4 according to condition of Machines	mns 3 & 4	t according	to conditio	n of Machin	ıcs	
S. No.	. Category of Equipment			Total Nos.	Total Value	Workin	Working condition	Under Repairs	Repairs	Beyond Ecc Repairs	Beyond Economical Repairs	Surplus	S
					•	Nos.	Value	Nos.	Value	Nos.	Value	Nos.	Value
1	2		l	8	4	5	9	7	æ	6	10	11	12
	Excavators (Including Dredgers)			461	2,267.53	339	1,759.87	107	477.95	15	29.71	52	167.33
E) Tractors (Cr.)	-		2,337	3,833.47	1,125	2,469.51	914	1,208.98	298	154.98	999	472.20
≘	(ii) Tractors (Wh.)		•	276	170.28	112	89.74	123	58.43	41	22.11	133	44.08
3.	Dumpers		•	1,500	3,354.03	883	2,253.37	473	817.16	144	283.50	299	364.04
4. ©	(i) Scrapers (M)		•	822	1,964.78	476	1,319.49	251	555.594	95	89.35	125	163.83
Ξ	(ii) Scrapers (T)			214	116.85	151	95.41	29	9.15	¥	12.29	63	22.26
5.	Motors Graders			205	181.65	106	109.12	74	58.19	25	14.34	47	28.10
6. (i)	(i) Front End Loaders (Cr.)			89	95.49	43	57.14	21	36.25	4	2.10	13	23.34
Ξ)	(ii) Front End Loaders (Wh.)	•		43	68.47	34	54.75	∞	12.11	-	1.61	7	3.11
7.	Cranes (All Types)			23	805.07	161	747.05	33	56.61	7	1.41	23	27.66
œ	Batching & Mixing Plants	•		7	100.95	7	100.95	:	:	:	:	:	:
6	Air Compressors (All Types)			544	209.07	388	159.45	127	42.31	29	7.31	82	36.30
10.	Drills & Drilling Equipment			234	208.44	192	163.10	37	43.34	S	2.00	34	29.29
11.	Crushing, Screening, & Processing Plants.			100	55.46	80	43.26	18	11.80	7	0.40	6	7.98
12.	Locomotives			98	32.35	49	31.46	7	68.0	:	:	7	1.14
13.	Agitating Cars	•		4	5.33	7	2.67	7	2.66	•	:	:	:
14.	Cable Ways		•	4	71.78	4	71.78	:	:	:	:	:	:
15.	Belt Conveyors	•		7	5.92	9	4.07	_	1.85	:	:	-	185
16.	Tractor Trailors	•		156	91.88	139	81.71	14	10.00	33	0.17	11	3.03
17.	Vibratory Rollers			23	19.09	=	10.34	12	8.75	:	:	-	0.40
18.	Mobile workshops			10	4.96	∞	4.11	:	:	7	0.85	7	0.85
19.	Water Tankers & Sprinkler	•		25	15.84	23	8.48	7	7.36	:	:	_	0.14
20.	Muckers and Rocker Shovels	•	•	17	69.10	12	57.85	5	11.25	:	:	:	:
21.	Fort Lifts	•	•	9	3.90	5	3.27	-	0.63	:	:	:	:
22.	Ditchers/Trenchers	•	•	23	3.05	_	1.29	:	:	22	1.76	22	1.76
23.	Mine Car Loaders	•	•	4	0.48	m	0.18	-	0.30	:	:	-	0.30
24.	Pile Driving Equipment	•	-	48	52.03	34	46.15	7	5.88	:	:	:	:
25.	Tugs & Barges	•	•	49	117.60	49	117.60	:	:	:	:	:	:
	Total		İ	7,474	3,924.85	4,473	9,863.17	2,274	3,437.79	727	623.89	1,594	1,398.99

APPENDIX 1.8

(Value in Rs. lakhs)

CENSUS/VALUE OF INDIGENOUS ITEM OF EQUIPMENT

9. INO.	5. Category of Equipment	Central	Central Government	State Go	State Governments	Governii rations/U	Government Corporations/Undertakings	İ	Private Bodies		10tai
		Nos.	Value	Nos.	Value	Nos.	Value	Nos.	Value	Nos.	Value
-	2	3	4	S	9	7	&	6	10	11	12
-:	Excavators (including Dredgers)	. 12	70.86	134	976.18	40	314.12	45	342.27	231	1,703.43
,	(i) Tractors (Cr)	. 472	618.98	194	601.68	82	845.52	10	35.14	757	1497.75
′ ∃ i	(ii) Tractors (Wh.).	. 80	11.00	85	39.14	26	6.68	113	5.67	204	62.49
3,	Dumpers	;	;	114	375.77	69	147.63	49	62.59	232	585.99
4	4. (i) Scraners (M)		į	112	595.16	:		:	:	112	595.16
, i) :	(ii) Scrapers (T)	10	12.21	34	49.43	7	1.85	:	:	46	63.49
ś	Motor Graders	मेव	2.75	13	29.13	4	10.68	:	:	18	42.56
9	Front End Loaders (Cr.)	जय		6	18.17	:	:	:	:	6	18.17
7.	Cranes (All Types)	. 13	43.80	54	135.26	19	328.60	48	134.00	179	689.22
∞;	Air Compressors (All Types)	. 897	570.69	508	197.97	155	77.55	157	79.47	1,712	922.94
9.	Drills & Drilling Equipment	. 13	7.42	204	130.79	141	254.96	58	54.95	416	448.12
10.	Crushing, Screening and Aggregate Processing Plants	. 448	192.53	219	73.58		0.18	55	28.01	723	294.30
11.	Locomotives	:	:	8	3.62	7	15.31	:	:	7	18.93
12.	Belt Conveyors	:	:	7	5.92	18	98.35	9	1.50	31	105.77
13.	Tractor Trailors	. 16	5.95	20	10.99	43	7.66	35	29.94	114	54.54
4.	Vibratory Rollers		0.12	7	3.52	:	:	;	;	œ	3.64
15.	Mobile Workshops	9 .	9.42	:	:	:	:	;	:	9	9.42
16.	Fork Lifts	:	:	:	:	23	5.77	5	5.32	78	11.09
17.	Pipe Driving Equipment (including Vibrosinkers)		2.78	:	:	:	:	:	:	7	2.78
18.	Tugs and Barges	. 63	191.10	:	:	:	:	:	:	63	191.10
	Torat	2.036	1,739.61	1,720	3,246.86	179	1,444.56	479	778.86	4,900	8,370.89

INDIGENOUS MANUFACTURERS OF MAJOR CATEGORIES OF EQUIPMENT

S. N	No. Item of Equip	ment	t				Name of Manufacturers
1		2					3
1.	Excavators .	•	•	•	•	(i) (ii) (iii)	Tata Engineering & Locomotives, Jamshedpur. Hindustan Motors, Calcutta. Heavy Engineering Corporation, Ranchi.
2.	Dumpers		•	•	•	(i) (ii)	Bharat Earth Movers Ltd., Bangalore. Hindustan Motors, Madras. Ashok Leyland, Madras. Tata Engineering & Locomotives, Co., Jamshedpur.
3.	Tractors (Crawler)	•	•	•		(i) (ii)	Bharat Earth Movers Ltd., Bangalore. Hindustan Motors, Madras.
4.	Tractors (Wheeled)		٠	•	•		Bharat Earth Movers, Ltd., Bangalore. Hindustan Motors, Madras. Escorts, Ltd., Faridabad. Eicher Tractors India, Ltd., Faridabad. M/s. Hindustan Tractors Ltd., Bombay. International Tractors Co., Bombay.
5.	Scrapers (Motorised))				(i)	Bharat Earth Movers, Ltd., Bangalore.
6.	Scrapers (Towed)	•		•	•	(i) (ii)	Construction Equipment Co. Pvt. Ltd., Baroda. Hindustan Motors, Calcutta.
7.	Loaders	•	•	•	•	(i) (ii)	Bharat Earth Movers Ltd., Bangalore. Hindustan Motors, Madras.
8.	Motor Graders .					(i)	Bharat Earth Movers Ltd., Bangalore.
9.	Cranes (Mobiles)				•	(i) (ii)	Coles Crane of India, West Bengal. Kumardhobi Engineering Works, Calcutta.
0.	Air Compressors 100) cm.	& ab	ove	٠	(i) (ii) (iii) (iv) (v) (vi) (vii) (viii)	M/s. Ingersoll Rand (I) Pvt. Ltd., Bombay. M/s. Garden Reach Workshops, Calcutta. M/s. Consolidated Pneumatic Tools Co., (India) Pvt. Ltd., Bombay M/s. S.L.M. Mancklal Industries Ltd., Ahmedabad. M/s. Holman Climax Mfg. (P) Ltd., Calcutta. M/s. Kirloskar Pneumatic Co. Ltd., Poona. M/s. Atlas Corpo. India (P) Ltd., Bombay. M/s. K.G. Khosla & Co., (P) Ltd., Delhi.
1.	Dredgers .	•	•	•	•	(i) (ii) (iii) (iv) (v) (vi)	M/s. Port Engineering Works, Calcutta.
2.	Drills and Drilling E	quip	ment		٠	(i) (ii) (iii) (iv) (v) (vi) (vii) (viii) (ix) (x) (xi)	M/s. Kirloskar Pneumatic Co. Poona.

ı	2		3
13.	Road Rollers	. (i)	M/s. Jeessop & Co., Calcutta.
		(ii)	M/s. Britannia Engg. Co., Calcutta.
	•	(iii)	M/s. Garlick & Co., Calcutta.
		(iv)	M/s. Garden Reach Workshops, Calcutta.
		(v)	M/s, Kamani Engg, Corporation, Bombay.
14.	Diesel Engines 50.H.P. and above	, (i)	M/s. Kirloskar Oil Engines Ltd., Poona.
		(ii)	M/s. Ruston & Hornsby (I) Ltd., Poona.
		(iii)	M/s. Premier Automobiles Ltd., Bombay.
		(iv)	M/s. Kirloskar Cummins, Poona.
		(v)	M/s. Simson & Co., Madras.
		(vi)	M/s. Ashok Leyland, Madras.
		(vii)	M/s. Tata Engg. & Locomotives, Jamshedpur.
		(viii)	M/s. S.L.M. Maneklal Industries Ltd., Ahmedabad.
		(ix)	M/s. Alcock Ashdown & Co. Ltd., Bombay.
		(x)	M/s. Lynx Machine Ltd., Calcutta.
		(xi)	M/s. Garden Reach Workshop, Calcutta.

Appendix-1.10 FUTURE PROGRAMME OF MANUFACTURE OF HEAVY EARTHMOVING EQUIPMENT

Name of the Firm/Description of Equi	pmen	t per	E.					197273	1973—74
	É			B			-	Nos.	Nos.
I. M/s. Bharat Earth Movers Ltd.	7								
1. Crawler Tractors (a) D-50 (b) D-80 (c) D-120 A-18				9				300 200 120	300 200 120
2. Motor Grader	. A			7				35	35
3. Motorised Scrapers	V			d				40	40
4. Haulpak Dumpers		सदापे	व जय	à					
(a) LW-25 (b) LW-35								50 150 20	50 150 22
5. Front-end Loaders TIGAR								50	50
I. M/s. HINDUSTAN MOTORS LTD. 1. Terex Equipment									
 (a) Dumpers 25-T payload capacity. (b) Crawler Tractors Model 82-40. (c) Front-end Loaders wheeled 2½ cu 					· ·	•		100 20	100 25 30
2. Hind Marion Excavators, 2.5 to 4 cu.								30	30
I. M/s. Ashok Leyland Dumpers — (OFF-The-Highway)									
(a) Hippo 15-T Capacity (b) Beaver 12-T. Capacity	• •	•		•			•	70 40	70 40
V. M/s. Telco, Jamshedpur.									
V. M/s. Telco, Jamshedpur. Exeavators, 1½ to 4 cu. yd. capacity								60	60
·			•		•	•	•	60	60

APPENDIX 1.11
YEARWISE CENSUS/VALUE OF EQUIPMENT

Year	(Central G Departme		State Gor Departme Projects		Govt. Und and Corp		Private l	Bodies	To	tal
	_	Nos.	Value	Nos.	Value	Nos.	Value	Nos.	Value	Nos.	Value
1		2	3	4	5	6	7	8	9	10	11
1971 (pa	rt)	30	120.00	31	47.07	20	60.39	8	22.10	89	249.56
1970		21	46.81	273	898.60	287	990.70	62	169.77	643	2105.78
1969		163	447.92	421	1724.49	205	861.62	151	279.89	940	3313.92
1968		233	435.41	468	1577.95	126	230.95	90	179.03	917	2423.34
1967		226	45.58	513	1382.44	171	993.62	156	409.78	1066	3236.42
1966		264	224.89	629	1223.32	256	719.03	183	383.31	1332	2550.55
1965		952	1090.98	820	1579.63	257	862.36	170	337.55	2197	3870.52
1964		308	189.22	665	1426.72	193	385.70	134	183.59	1300	2185.23
1963		496	502.43	521	802.06	239	778.37	52	124.48	1308	2207.34
1962		312	249.06	388	383.71	179	437.22	48	46.66	927	1117.19
1961		285	215.82	429	370.03	72	155.23	121	207.22	907	948.30
1960		307	278.63	445	276.58	98	577.56	84	70.77	934	1203.52
1959		135	156.79	203	138.18	255	684.82	32	41.79	625	1021.50
1958	•	7	3.73	321	257.38	177	463.08	43	59.68	548	783.87
1957		3	1.24	252	277.37	123	253.00	38	39.40	416	571.01
1956		28	27.53	238	2 84.53	142	212.50	13	39.19	421	563.75
19 5 5		11	5.92	208	133.47	6	2.59	13	19.65	238	161.63
1954		1	2.33	105	80.69	2	1.63	12	11.84	120	96.39
1953			.,	165	153.02	40	43.63	8	16.32	213	212.97
1952				60	52.52	3	4.47	3	3.98	66	60.97
1951		2	2.10	72	22.73	स्यमव जय	0.50	1	0.80	76	26.13
1950		1	0.60	90	40.46	2	0.49	2	0.50	95	42.05
1949		2	2.29	. 64	35.24	1	0.15	3	1.57	70	39.25
1948		1	1.00	30	8.78			4	1.90	35	11.68
1947				7	1.27	14	23.69	2	0.32	23	25.28
1946				16	3.93	J	0.16	1	0.12	18	4.21
1945				2	0.40					2	0.40
1940				2	0.74			.,		2	0.74
1937								4	0.58	4	0.58
1936						2	0.27			2	0.27
1935						5	5.00			5	5.00
1934						2	0.27	.,		2	0.27
1933						4	4.00			4	4.00
1924						2	0.25			2	0.25
1913						1	1.25			1	1.26
Not indi cated	-			104	88.07	11	24.35			115	112.42
Total	. –	3788	4455.72	7542	13271.38	2897	8778.73	1438	2651.79	15665	29157.62

STATEMENT SHOWING CATEGORY-WISE POPULATION & VALUE OF EQUIPMENT IN THE COUNTRY

(Value in Rs. Lakhs)

APPENDIX 1.12

							4	no o da	3 / min	DICAN UP OF COLUMN 3 & 4 ACCOLUMNS TO COMMITTED TO MINACIMINES		o macinity	ż	
St. No C	Category of Equipment				Total Nos.	Total Value	Working	Working condition	Under Repairs	tepairs	Beyond E	Beyond Economical Regairs	Surplus	lus
						•	Nos.	Value	Nos.	Value	Nos.	Value	Nos.	Value
1	2				3	4	S	9	7	∞	6	10	11	12
. Excavators (Excavators (including Dredgers)		•	•	843	6,083.82	692	5,447.68	130	586.28	21	. 49.86	63	198.47
2. (i) Tractors (Cr.)			•	•	4,408	7,167.84	2,395	4,711.52	1,278	1,923.68	735	532.64	989	550.93
(ii) Tractors (Wh.)	'h.) · · ·		•	•	694	362.87	466	226.00	162	104.76	99	32.11	184	93.39
3. Dumpers.		•	•	•	2,489	5,931.50	1,690	4,555.10	909	1,014.72	194	361.68	369	445.27
4. (i) Scrapers (M)			•	•	766	2,410.79	909	1,625.56	290	659.79	101	125.44	149	274.99
(ii) Scrapers (Towed)	(bəwo	•		•	294	230.35	208	169.89	43	42.54	43	17.92	78	32.85
5. Motor Graders	ders	•	•	•	373	336.24	219	215.87	108	94.91	46	25.46	09	40.56
6. (i) Front End Loaders (Cr.)	Loaders (Cr.) . •		•		130	214.90	84	136.05	41	74.07	5	4.78	25	21.30
(ii) Front End Loaders (Wh.)	Loaders (Wh.)	•	•	•	182	322.69	120	239.34	47	62.21	15	21.14	17	21.78
7. Cranes (All Types)	Types)		•	•	829	2,533.54	706	2,259.86	135	251.65	18	22.03	i 29	233.11
8. Batching an	Batching and Mixing Plants	•			16	146.67	15	1 46.62	_	0.05	:	:		0.05
9. Air Compre	Air Compressors (All Types)				2,039	1,035.21	1,383	564.84	518	425.89	138	44.48	222	71.23
10. Drills and D	Drills and Drilling Equipment		•	•	581	731.60	514	663.39	54	50.04	13	18.17	45	46.47
. Crushing, St	Crushing, Screening & Aggregate Processing Plants	ocessin	g Plan	ts.	. 763	423.24	574	319.83	179	100.08	10	3.33	17	36.78
12. Locomotives	• • • • • •	•	•	•	131	241.09	95	212.68	35	23.41	-	5.00	33	15.78
13. Agitating Cars	ars		•	_	4	5.34	7	2.67	61	2.67	:	:	:	·
14. Cable Ways			Eii		4	71.79	4	71.79	:	:	:	:	1	30.00
15. Belt Conveyors	AOTS . STOW				100	127 07	10	125 42	4	1 65			-	0

-	2	3	4	5	9	7	8	6.	10	11	12
16.	Tractor Trailors	. 360	189.29	320	174.41	37	14.70	33	0.18	24	5.86
17.	Vibratory Rollers	. 28	19.89	12	10.51	15	9.21	-	0.17	-	0.40
18.	Mobile Workshops	. 17	14.68	14	13.53	-	0.30	7	0.85	3	1.15
19.	Water Tankers and Sprinklers		15.85	23	8.48	2	7.37	:	:	-	0.14
20.	Muckers/Rocker Shovels	. 25	88.48	21	77.23	ς.	11.25	:	:	:	:
21.	Fork Lifts	. 126	62.09	95	43.80	12	9.07	19	9.22	10	5.00
22.	Ditchers/Trenchers	. 26	8.05	7	2.29	7	4.00	22	1.76	22	1.76
23.	Mine Car Loadres	4	0.29	3	0.18	=	0.11	:	:	:	:
24.	Pile Driving Equipment (including Vibrosinkers) .	53	55.19	39	49.31	14	5.88	:	:	:	:
25.	Tugs and Barges	. 63	19.10	63	191.10	:	:	:	:	:	:
26.	Ore Loading Plants		14.40	-	14.40	:	:	:	:	:	:
27.	Asphalt Distributors and Pavers Finishers	. 25	21.42	20	17.96	5	3.46	:	:	:	:
28	Spreaders	e .	100.34	ю	100.34	:	:	:	:	:	;
	TOTAL	15,665	15,665 29,157.62	10,485 2	10,485 22,397.65	3,727	5,4838.75	1.453	1,276.22	2,141	2,138.14

AVERAGE UTILISATION OF MAJOR CATEGORIES OF EQUIPMENT FROM THE DATE OF INITIAL COMMISSIONING TO END OF 1970 AND DURING THE LAST FIVE YEARS IN RESPECT OF SELECTED PROJECTS/DEPARTMENTS IN DIFFERENT SECTORS

(Figures indicate percentage efficiency)

			Excavators	SJC	Tra	Tractors (Cr.)	·	-	Dumpers		Scra	Scrapers (M)		J	Cranes	
Sl. No. Name of State/Project	ħ		Average	:		Average			Average		Ave	Average		Ą	Average	
or Department		During the last five years	g From the date of initial Commission	Max. in any year during the last five	During the last five year	From the date of ini- tial Com- missio- ning	Man. in any year during the last five	During the last five years	From the date of ini- tial Com- missio-	Max. in any year during the last five	During the last five years	From the year of ini- tial Com- missio- ning	Max. in any year during the last five years	During the last five years	From the date of initial Commission	Max. in any year during the last five years
1 2		۵.	4	٧.	9	7	×	6	10	=	12	13	14	15	91	11
Andhra Pradesh								8								
1. Srisailam		. 13.1	1 22.3	30	23.3	19.0	102	10	21.5	20	:	:	:	15	15	0†
2. N.S. Right Canals .	٠	6.91	9 28	79	6.2	4	57		1	:	16	24	43	15	11.5	22
3. N.S. Left Canals	•	. 35	5 31	56	91	21	77	10	6	15	22	34	118	7.	13	۲. 4
4. N.S. Dam	٠	. 15	5 17	33	नयः	Į.		23	्टा	51	:	:	:	6.1	13.6	27
Bihar					ì)	7		2							
5. Tenughat	•	. 32	38.8	90	22	26.2	45	36	3.7	. 42	37	37	42	:	:	:
Delhi																
6. Flood Control Department	ږ د .	. 49	67 6	64.7	40	40	47	:	:	:	:	:	:	:	:	:
7. Badarpur Thermal		•	:	:	32	32	33	:	:	:	:	:	:	20	30	E.
Gujarat																
8. Ukai		. 57	7 55.7	16	36	45	101	41	42.1	63	19	51.5	74	:	:	:
Haryana																
9. Drainage Circle		46.9	9 44.5	92	3.2	3.2	44	:	:	:	;	:	:	:	:	:
Himachal Pradesh																
*10. Beas Unit I		. 42.2	2 44	80	45.1	33	<u>1</u>	43	53	77	:	;	:	:	:	:
11. Giri Hydel		. 47	7 47	<u>5</u> 9	32.9	32.9	59	23	25	82	:	:	:	:	:	:
12. Uhl Hydel		. 21	1 29.4	31	27	42.6	79	27	29.4	38.6	:	;	:	:	:	:

1. 41 80 41 80 41 80 41 80 31 41 80 31 41 80 31 41 10 31 41 10 31 11 10 60 75 11 80 11<	41 80 22 25.9 35 14 20 31 21 16 62 6 7.5 17 17.5 30 35 34 3				en	4	5 6		7	∞	6	10	11	12	13	14	15	16	17
1.3 3. 3 8 6 6 10 1.1 16 17 20 35 8 11 19 14 18 31 1.1 5.4 9 9 9 9 9 9 3.5 3 4 3 3 </td <td>1.6 1.6 1.7 3.1 3.2 3.2 3.2 3.2 3.2 3.2 3.2 3.2 3.2 3.2 3.2 3.2 4.2 4.2 4.2 3.2 3.2 3.2 4.2 4.2 4.2 3.2<td>13. J. & K. Flood Control</td><td></td><td></td><td>35</td><td>41</td><td>98</td><td>22</td><td>25.9</td><td>35</td><td>14</td><td>20</td><td>31</td><td>21</td><td>16</td><td>62</td><td>9</td><td>7.5</td><td>11</td></td>	1.6 1.6 1.7 3.1 3.2 3.2 3.2 3.2 3.2 3.2 3.2 3.2 3.2 3.2 3.2 3.2 4.2 4.2 4.2 3.2 3.2 3.2 4.2 4.2 4.2 3.2 <td>13. J. & K. Flood Control</td> <td></td> <td></td> <td>35</td> <td>41</td> <td>98</td> <td>22</td> <td>25.9</td> <td>35</td> <td>14</td> <td>20</td> <td>31</td> <td>21</td> <td>16</td> <td>62</td> <td>9</td> <td>7.5</td> <td>11</td>	13. J. & K. Flood Control			35	41	98	22	25.9	35	14	20	31	21	16	62	9	7.5	11
1. 16 17 20 35 8 11 19 14 18 31 1.1 5.4 3 28 55 32 32 32 32 59 40 43 74 23.6 23.6 32.5 15 24 29 29 72 32.6 32.6 32.6 32.6 32.6 32.6 32.6 32.6 32.6 32.6 32.6 32.6 32.6 32.6 32.6 32.6 32.7 <td< td=""><td> 16 17 20 35 8 11 19 14 18 31 1.1 54 3 28 55 32 32 32 32 32 39 40 43 74 23.6 23.6 33.5 13.4 18.4 29 29 72 17 115 39 39 90 </td><td>•</td><td>•</td><td></td><td>15</td><td>17.5</td><td>50</td><td>14</td><td>12</td><td>33</td><td>ĸ,</td><td>ю</td><td>œ</td><td>:</td><td>•</td><td>:</td><td>9</td><td>9</td><td>10</td></td<>	16 17 20 35 8 11 19 14 18 31 1.1 54 3 28 55 32 32 32 32 32 39 40 43 74 23.6 23.6 33.5 13.4 18.4 29 29 72 17 115 39 39 90	•	•		15	17.5	50	14	12	33	ĸ,	ю	œ	:	•	:	9	9	10
13. 16 17 20 35 8 11 19 14 18 31 1.1 5.4 3 28 55 32 32 32 32 39 40 43 74 23.6 23.6 32.5 13.4 18.4 29 29 72 1.7 115 1.7 23.6 33.7 32.5 32.5 33.7 33.7 32.6 33.7 33.7 32.6 33.7 33.7 30.7 1.1 11 </td <td>1. 1.<</td> <td></td>	1. 1.<																		
28 55 32 55 32 59 40 43 74 23.6 23.6 32.5 15 24 29 29 72 39 39 90	28 55 32 32 35 32 32 36 40 43 74 23.6 32.6 32.5 15 24 29 29 72 39 39 90 <	•	•		4.7	:	16	17	20	35	∞	11	19	14	18	31		5.4	9
28 55 32 35 32 35 36 40 43 74 23.6 23.6 15 24 29 29 72 7	28 55 32 55 32 39 40 43 74 23.6 23.6 32.5 15 24 29 29 72 39 39 90				•		•												
15 24 29 29 72 17 115 39 39 90 17 115	15 24 29 29 72 39 39 90	•		•	28	28	55	32	32	55	32	32	59	40	43	74	23.6	23.6	32.5
13.4 18.4 56.3 71 8.8 18 31.7 50.7 14 14 22.6 71 23 20 81 26 26 108 14 14 100 101 122 80 79 111	13.4 18.4 56.3 71 8.8 18 31.7 50.7 14 14 22.6 71 2.6 26 108 14 14 100 101 122 80 79 111	•			15	15	24	29	29	72	:	:	:	39	39	90	:	:	:
13.4 18.4 56.3 71 8.8 18 31.7 50.7 14 14 22.6 71 23 26 81 26 108	13.4 18.4 56.3 71 8.8 18 31.7 50.7 14 14 22.6 71 26 26 108	•		•	:	:	:	:	:	:	25	17	115	:	:	:	:	:	:
22.6 71 23 20 81 26 26 108	22.6 71 23 20 81 26 26 108	•	•	•	;	13.4	18.4	स्यम	56.3	71		∞ ∞	18	:	31.7	50.7	. :	14	14
67.7 144 100 101 122 80 79 111	67.7 144 100 101 122 80 79 111	•	•	,		22.6	11	23	20	18	26	3 6	108	:	:	:	:	:	:
52 53 53 66 82 24 21.7 38 17.2 18.5 33.1 64 20 40 40 30.3 28 21.1 30 35 14 28.4 20 4.4 4.4 36.2 151 37 39 73 23 24 76 9 18.1 15 12 17	52 53 53 66 82 24 21.7 38 <td>•</td> <td></td> <td></td> <td></td> <td>67.7</td> <td>144</td> <td>100</td> <td>101</td> <td>122</td> <td>8</td> <td>79</td> <td>111</td> <td>:</td> <td>:</td> <td>:</td> <td>:</td> <td>:</td> <td>:</td>	•				67.7	144	100	101	122	8	79	111	:	:	:	:	:	:
17.2 18.5 33.1 64 20 40 40 30.3 28 21.1 30 35 14 28.4 20 4.4 4.4 36.2 151 37 39 73 23 24 76 9 18.1 15 12 17	17.2 18.5 33.1 64 20 40 40 30.3 28 21.1 30 35 14 28.4 20 4.4 4.4 36.2 151 37 39 73 23 24 76 9 18.1 15 17 6 28 13 18 36 1.8 2.8 2.1 46 51 112 4 12	•	•		43	52	53	53	99	82	:	:	:	24	21.7	38	:	:	:
30.3 28 21.1 30 35 14 28.4 20 4.4 4.4 36.2 151 37 39 73 23 24 76 9 18.1 15 12 17	30.3 28 21.1 30 35 14 28.4 20 4.4 4.4 36.2 151 37 39 73 23 24 76 9 18.1 15 12 17 6 28 13 18 36 1.8 2.8 2.1 46 51 112 4 12	Tamil Nadu 23, Perambikulam Aliyar	•		:	17.2	:	18.5	33.1	64	:	:	:	20	40	40	:	:	•
36.2 151 37 39 73 23 24 76 9 18.1 15 12 17	36.2 151 37 39 73 23 24 76 9 18.1 15 12 17 6 28 13 18 36 1.8 2.8 2.1 46 51 112 4 12	•		•		30.3		21.1	30	35	14	28.4	20	:	:	:	4. 4.	4.	13
	6 28 13 18 36 1.8 2.8 2.1 46 51 112 4 12	•	,			36.2	151	37	39	73	23	24	92	5	18.1	15	12	17	43

1 2			٣	4	5	9	7	8	6	10	11	12	13	41	15	16	17
Central Government																	
†27. Rehabilitation Reclamation	_		:	:	:	56	58	111	;	:	:	:	:	:	:	:	:
28. Rajasthan Atomic .		•	:	:	:	:	;	:	:	:	:	;	;	43	;	43	78
29. Madras Atomic	•	•	;	:	:	:	:	:	:	:	:	:	:	:	14	14	24
Government Corporations/Undertakings	ıdertak	cings															
30. Neyvelí Lignite	•	•	62	99	79	94	94	120	74	74	86	:	:	:	122	106	190
31. H.S.L. Bhilai	•		17	4	33.3	00	16	24	13.5	13.2	20	4	19	11	17	33	54
32. H.S.L. Rourkela	•		:	:	:	101	103	228	8	63.4	=	;	:	:	49	52	128
33. H.S.L. Barsua Mines .		•	36	99	74	13.4	42	23.3	37	61.4	44	:	:	:	:	;	:
34. N.M.D.C. (Bailadila)			41	41	66	09	74	122	51	51	64	•	:	:	:	:	:
35. N.M.D.C. (Kiriburu)			:	45	88	्र जि	30	43		37	48	:	:	:	:	:	:.
36. N.M.D.C. (Donamalai)			:	57	57	त्रे स्ते	. 75	75		:	:	•	:	:	:	:	:
37. N.C.D.C.	•	•	:	100	147	:	75	100	3	30	157	:	:	:	:	19	90
38. N.P.C.C			28	34.2	43.2	11.7	22.7	31.1	11.3	18	20	:	18.4	;	:	:	:
Private Bodies 39. Tata Iron & Steel Co.	•		120	121	144	118	104	150	120	123	152	:	:	:	100	100	100
40. Hindustan Const. Co.	•		36	:	116	54	54	82	33	33	74	:	:	:	51	51	104

NOTE—Schedules for calculating utilisation efficiency in all the appendices have been taken on the following basis:--*(i) Beas Unit I & II—Three shifts work per day or a schedule of 3600 hours per year.

†(ii) Rehabilitation Reclamation Organisation—Single shift work per day or a schedule of 1400 hours per year.

(iii) Other Projects/Department—Twe shifts work per day or a schedule of 2500 hours per year.

EQUIPMENT UTILISATION (Category-wise)

Category of Machine: Excavators

Sl. No.	State/Project or Department	Description of machines	Year of purchase	Nos.	tota w	erage d hours orked p achine		Average Utilisatio as percen schedule		igures f Maximun utilisation in any
					the	iring clast c years	From the date of initial Commissioning	During the last five years	From the date of initial Commissioning	year during the last five years as percen- tage of schedule
1	2	3	4	5		6	7	8	9	10
	STATE GOVERNMEN	uts								•
	Andhra Pradesh									
1.	Srisailam	Lima 2.5 Cyds.	1964		1	. 33	36	1.3	1.4	6.7
		Tata P&H 2.5 Cyds. 955 A	1965	W. Sala	1	538	956	22	38.2	30
		Skoda Ry. 2.5 Cyds. 150	1966		1	37	36	1.5	1.4	6
		Skoda Ry. 2.5 Cyds. 150	1965		1	28	20	1.1	0.8	6
2.	N. S. Right Canal	North West 2.5 Cyds.	1957	Mil	HT.	538	810	21.5	36	79
		5W-Walking Dragline	1960		1/-	312	505	12.4	20	22
3.	N. S. Left Canal	Lima 2.5 Cyds.	1967		1	7 84	784	31	31	41
		North West 2.5 Cyds.	1958	11302	1	979	1147	39	46	56
4.	N. S. Dam .	P&H 955A 2:5 Cyds.	1957	स्यमेव	नयने	372	422	15	17	33
	Bihar									
5.	Tenughat	P&H 955A 2.5 Cyds	1965		5	652	964	26	38.6	32
		Hind Marion 3 Cyds.	1966		4	998	998	39	39	50
	Delhi									
6.	Delhi Flood	Skoda Ry. 1.25 Cyds.	1962		5	1094		43.8		64.7
	Control.	22 R.B. 0.75 Cyds.	1962			1053		42		46
		Tata P&H 2.5 Cyds.	1967			1492		59		63
	Gujarat									
7. t	Jkai	Osgood 2.5 Cyds.	1966		2 1	1516	1460	60	58	76
		Demag 1 to 2.5 Cyds.	1958			1282	1155	51	46	60
		North West 0.75 Cyds				2082	2082	83	83	83
		R.B19-0.75 Cyds.	1966		1	601	1939	24	79	48
		Marion 1.5 Cyds.	1960		1	1769	1184	71	47	91
		Tata P&H 2.5 Cyds.	1967		1	1452	1452	57	57	66
		Tata P&H 2.5 Cyds.	1962			1452	1316	57	53	66
		Tata P& H2.5 Cyds.	1963			1452	1347	57	54	66
		Tata P&H 2.5 Cyds.	1966			1452	1452	57	57	66
		Hind Marion 3 Cyds.	1964		3	721	589	29	23	65
		Tata P&H 2.5 Cyds.	. 1969		3	2103	2103	84	84	84

_	. 2		3	4	5	6	7	8	9	10
	Haryana									
3.	Haryana Dra	inage	Link Belt 2.5 Cyds.	1961	1	116	481	4.6	19	22.
	•		P &H 2.5 Cyds.	1964	3	942	1111	38	44.4	51
			Skoda D/Line	1962	4	1264	1721	69	50.6	74
			R. B. 3.5 Cyds.	1964	2	932	1125	37.3	45	92
	Himachal Pra	desh								
•	Beas f .		Tata P & H 995A 2.5 Cyds.	1964-70	4	1170	1311	46.8	52.4	71.5
			Marion 93M 2.5 Cyds.	1966	3	814	814	32.5	32.5	36
			Link Belt 2.5 Cyds.	1966	2	734	734	29.3	29.3	36
			Bucyrus-71 3.5 Cyds.	1968	2	1506	1506	60.2	60.2	80.4
	Uhl Hydel Stage II		Universal	1963	1	537	735	21	29.4	30.6
	Giri Hydel		Tata P&H 1.5 Cyds.	1967-68	2	1206	1206	48	48	65
	•		R.B. 22 3/4 Cyds.	1967	ı		1533	••	61	
			R. B. 22	1969	1	••	2000		80	
	Jammu & Kas	hmir								
•	J&K Flood C	ontro	ol Tata P&H 995 A 2.5 Cyds.	1962		783	852	31	34	56
			Tata P&H 995A 1.5 Cyds.	1968	1	688	688	28	28	40
			R.B. 1.5 Cyds.	1961	2	110 1	1435	44	57.4	80
	Kerala			9.0	THE					
	Iddiki .		Hind Marion 3 Cyds.	1968	25	431	431	17.2	17.2	18.8
			Tata P&H 995A 2.5 Cyds.	1965		1244	1244	50	50	50
			Universal 503 Poli- max.	1961	3	483	313	19	12.5	35
	Maharashtra			सन्य	मव जय	Ŧ.				
	Mula .		Hind Marion 101M 3 Cyds.	1966	3	1070	1070	43	43	55
			Tata P&H 955A 2.5 Cyds.	1965	1	472	472	19	19	36
			Tata P&H 955A 2.5 Cyds.	1959	1		420	••	17	••
	Jaykawadi		Hind Marion 3 Cyds.	1966	2	378	378	15	15	24
	Mysore									
	Ghataprabha ject.	Pro-	Tata P&H Shovel	1966	4	••	336		13.4	18.4
	Madhya Prade	esh								
	Tawa .		Tata P&H 2.5 Cyds.	1963-66	2	207	338	8	13.5	16
			Hind Marion 2.5 Cyds.	1964	2	36	570	1.4	23.0	1.4
	Orissa									
	Balimela .	•	Russian EXG 4.6 Cyds.	1963-66	5	1225	1257	49	50	71
			Russian E1252 1.6 Cyd	s. 1964	8	1264	285	10.6	11	28
			Lima 3.5 Cyds,	1969	5	206	206	8.2	8.2	8.2

1	2	3	4	5	6	7	8	9
	Punjah							
19.	Beas II	Hind Marion 3 Cyds.	1969	1	3564	3564	99	99
• • •		Tata P&H 2.5 Cyds.	1966	3	1611	1681	44.7	47
		150 B Elect. 7 Cyds.	1964	1	3208	3886	89	108
		150 B Elect. 7 Cyds.	1970	1	3389	3389	94	94
		P&H 7 Cyds.	1968	1	4000	4000	111	111
		71B Elect. 3.5 Cyds.	1969	1	4103	4103	114	114
		Tata P&H 2.5 Cyds.	1965	3	2372	2603	66	75
			1967	1	2372	2372	66	66
		Tata P&H 2.5 Cyds. Tata P&H 2.5 Cyds.	1963	1	2372	2630	66	73
	Rajasthan							
••	•	make DATE 2 Code	1963	8	1192	1378	18	55
20.	Rajasthan	Tata P&H 3 Cyds.			848	1114	34	44.6
	Canal	Tata P&H 2.5 Cyds.	1961	5	040	1114	34	44.0
	Tamil Nadu			_				
21.	Perambikulam Aliyar.	UNICOP	1961	3	• •	430	• •	17.2
	Uttar Pradesh							
22.		North West 1.5 Cyds.	1956-57	2	249	527	10	21
		Marion 2.5 Cyds.	1961	Jac2	294	1276	11.7	51
		Tata P&H 2.5 Cyds.	1962-63	3	406	567	16.2	22.7
23.	Ramganga	. Tata P&H 955-A 2.5 Cyds.	1964	6	852	1093	34	44
		Tata P&H 955-A 2.5 Cyds.	1970	2	852	852	34	34
		Tata P&H 955-A 2.5 Cyds.	1964	4	770	748	31	30
		Tata P&H 955-A 2.5 Cyds.	1966	2	770	748	31	30
		Tata P&H 955-A 2.5 Cyds.	1970	2	770	748	31	30
		Marion 7 Cyds.	1966	यमव जय	1952	1952	78	78
	West Bengal							
24.	Kansabati .	. R.B10	1957	2	663	442	27	18
		Tata P&H	1968	2	119	119	5	5
	GOVT. CORPORAT	TONS						
25	Nayveli Lignite	. R.B54 3.5 Cyds.	1958	2	1557	2104	62.3	84
	y . etcgiiite	Tata P&H 955-A	1967	2	1557	1557	62.3	62.3
		2.5 Cyds.						
		P&H-1.5 Cyds.	1963	1	1557	761	62.3	30.4
26,	H.S.L. Bhilai	. P&H-955A 2.5 Cyds.	1958	2	422	100	17	4
27.	H.S.L. Barsua Mines.	P&H-1300. 4 Cyds.	1959	4	1340	1503	56	60
28.	N.M.D.C.	B.E100	1962	4	2118	2118	85	85
	(Kiriburu)	P&H-955.	1962	2	144	144	6	6
2 9.	N.M.D.C.	Tata P&H	1969	2	492	492	20	20
	(Bailadila)	Russian	1966-67	5	1213	1213	49	49
30.	N.M.D.C.	Hind Marion-93M	1969	i	1420	1420	57	57

1	2	3	4	5	6	7	8	9	10
31.	N.P.C.C	P&H-955 2.5	1964	4	797	939	33	37.6	13.5
		Hind Marion 93-M	1963	6	923	990	37	39.6	60
		Hind Marion 362-M	1962	1	366	489	14.5	19.6	36
		Lima-803	1965	3	841	1097	34	44	55
		North West-14	1964	1	210	293	8.4	11.7	8.4
		Priestman VX	1963	1	86	861	3.5	34.4	12
	,	Hitachi 'U'	1964	1	453	754	18.1	30.2	54
		Skoda-150	1964	1	238	337	9.5	13.5	9.5
3 2 .	N.C.D.C.	110 R.B.	1957	4		2301		92	107
		110-B	1959	3	• • •	3344		134	147
		P&H-1300	1958	3		2418		97	103
		P&H-1600	1960	4		2420		97	109
		Marion 4161	1959	4	••	2199	• •	88	115
	PRIVATE BODIES								
33.	H.C.C	Tata P&H-955-A	1965	1	2312	2312	92.5	92.5	116
		Link Belt Sk-500	1965	3	526	526	21	21	38
		R.B22	1967	2	856	856	34.2	34.2	61
		Demag	1965	3	841	841	33.5	33.5	75.5
34.	TISCO .	. Tata P&H	1961	2	3280	3500	131	140	144
,		Tata P&H 955-A	1966	5	3075	3075	123	123	136
		Menck M-90	1958	2	2498	2648	100	106	106
		Bucyrus	1957	\hat{a}	3120	2600	125	104	136

APPENDIX 2.2.2

EQUIPMENT UTILISATION (CATEGORY-WISE)

Category of Machine: Tractors [Crawler]

S. No.	State/Project or Department	Description of Machines	Year of purchase	No. of machines	Average to worked pe macl	er year per	Average u as percen Sche	tage of	Figure of max. utilisation
					During last five years	From the date of initial Commissioning	During the last five years	From the date of initial Commissioning	in any year during the last five years as percen- tage of Schedule
1	2	3	4	5	6	7	8	9	10
	STATE GOVERNMEN	rs							
	Andhra Pradesh								
ı.	Srisailam	Russian DET-250	1966	2	41	41	1.6	1.6	5
		Cat. D-7	1964	2	1086	956	43	38.2	102
		Cat. D-8	1965	1	509	530	20	21.2	24
		I.H-TD 24	1963	2	661	401	26	16	55
2.	N. S. Right Canal	IH-TD-24	1957	5	90	380	3.6	15.2	9
		IH-TD-18	1957	4	112	250	4.5	10	17
		Cat. D-8	1957	2	644	635	26	25.4	54
		Cat. D-7	1957-65	2	653	968	26	38.7	57
		HD-11	1958	5	1	260	0.04	10.4	0.04
		IH-BTD-6	1957-59	9	77	224	3	9.0	6

1	2	3	4	5	6	7	8	9	10
3.	N. S. Left Canal.	AC-HD-21	1958	2	564	552	23	23	7 7
		AC-HD-16	1958-60	11	284	321	11	13	24
		IH-TD-24	1957-58	5	166	501	7	20	17
		Cat- D-8	1957-68	18	662	903	26	36	30
		Cat. D-7	1957-68	12	713	537	29	21	36
		Cat. D-9	1965	2	173	736	7	29	7.4
		AC-HD-6	1958	80	101	170	4	7	10
		Cat. D-6	1958	20	544	49	22	2	22
		BTD-6	1957	150	181	314	7	12	17
		DID-0	1757	150	101	314	,	12	17
	Bihar			_					
4.	Tenughat	AC-HD-21	1956	2	162	513	6	20.5	8
		AC-HD-9	1966	20	87	1538	3	61.5	4
		Cat. D-7	1966	2	376	1883	15	75.3	24
		Russian T-100M	1967	30	701	763	28	30.5	44
		Russian DET-250	1967	16	697	719	28	24.8	45
		BEML Komatsu	1968	5	689	689	28	28	38
		BEML Komatsu	1969	3	689	689	2.8	2.8	38
		BEML Komatsu	1967	1	689	707	28	28.3	38
		Let. (wheeled)	1966	20	89	89	4	4	4
	Delhi		^	ETA ~				,	•
-		17 15.0	10-03-	· A 是此意识	3 000	200			
	Badarpur Thermal Power Project		1970	1	800	800	32	32	32
6.	Delhi Flood Contr	ol Russian T-100M	1967	50	989	••	40	••	47
_	Gujarat		¥)	Will					
7.	Ukai	Cat. D-8 14A	1961	MARK	1284	• -	51		60
		Cat. D-8 14A	1963	2	1284	• •	51		60
		Cat. D-8	1966	2	1284		51		60
		Cat. D-8	1969	17	1284		51		60
		Cat. D-8	1956	I	1284	• •	51		60
		Cat. D-8	1958	प्रमान जयत	1284	• •	51		60
		Cat. D-8 H	1965	4	1772	••	78		101 4
		Komatsu D-120 and							
		D-80-8	1966	4	1000	1000	40	40	
		TD-24	1961	3	611	828	24	33	36
		TD-25	1965	9	937	1253	37	50	64
		Cat. D-9	1965	3	1376	1448	55	58	68
		CD-8C	1966	34	650	650	26	26	35
		CD-10G	1967	5	612	612	24	24	33
	Haryana								
8.	Haryana Drainage	Cat. D-7	• •	1	110	110	4.4	4.4	4.4
٠,	Circle	Cat. D-8	••	1	45	45	2	2	2
	Himachal Pradesh								_
o	Beas-l	Cat. D-8	1963	11	1668	1219	66.6	48.8	100.7
y .	Dono-t · ·	Cat. D-7	1963	6	869	731	34.8	48.8 29.2	100.7 49.3
		Komatsu D-80	1968-69	18	883	883	35.3	25.3	53.2
10.	Uhl Hydel Stage II	Cat. D-7	1962	3	678	1068	27	42.6	62
11.	Giri Hydel	Cat. D-6	1967	10	1405	1405	56	56	59
		Crawler 100 HP	1969	10	15	15	0.6	0.6	0.6
	T 0 -	Komatsu	1969	1	1051	1051	42	42	49
	J. & K.			_					
12.	J&K Food Contro		1963	2	459	440	- 18	17.6	28
		Cat. D-8	1961	8	574	695	13	28	35

1	2	3	4	5	6	7	8	9	10
	Kerala	,							
3.	Iddiki	Komtasu D-80	1970	2	113	113	4.5	4.5	4 5
	ruum, , ,	AC-HD 16	1958	2	587	500	23.5	20	4.5
				_	•••	200	2 3.3	20	33
	Madhya Pradesh								
4.	Tawa	AC-HD-21	1965	14	377	534	15	21.3	23
		Cat. D-6	1965	60	620	529	25	21	35
		Cat. D-8	1969	2	173	173	7	7	10
	Maharashtra								
5.	Mula	Cat. D-8	1967	14	1042	1042	43	43	5
		Russian DET-250	1965	6	501	501	20	20	43.8
		Komatsu D-80	1970	3	133	133	5.3	5.3	5.3
6.	Jayakwadi .	Cat. D-7	1966	6	1560	1560	60	60	7:
		Cat. D-8.68A	1965	8	475	475	19	19	4
		Cat. D-8, 22A	1967	2	724	724	29.6	29.6	6
		Cat. D-8. 46A	1967	4	400	400	16	16	28.4
		French CD-100	1967	12	600	600	24	24	27.0
	Mysore		~ 5						
17.	Ghataprabha .	Cat. D-9	1966	3	3	1732	••	69.3	72.
•		C-100	1969	70	9	2081	••	83.2	109
		CD-100	1967	30		261	••	10.4	18.8
		IH-TD-18A	1954-55	2		297	• • •	11.8	14.
	Orissa		V.V	TUIT					
Q	Balimela	Russian T-100M	1968	200	458		18.3		
	Dannieu , .	Cat. D-8	1964	4	600	548	24		31.3
		Komatsu D-120	1963	4	1104	670	44	22 27	3: 84
	n		7000						
	Punjab	0.4 10.0	1000	मव जयत	1207	1007			
19.	Peas II	Cat. D-8	1969	20	4207	4207	117	117	14.
		Cat. D-8	1963	4	2027	2158	56.3	60	74
		Cat. D-9	1965	5	2365	2694	66	75	9.
		Cat. D -9 Cat. D -9	1963 1969	4 5	2365 4682	2090 4682	66	58	9.
		Cat. Doy	1907	3	4002	4082	130	130	13
	Rajasthan								
20.	Rajasthan Canal	IH-TD-25	1964-67	27	1268	1618	51	64.7	8:
		Cat. D-8	1960 -6 4	13	1490	1698	56	68	8
	Tamil Nadu								
21.	Parambikulam	Komatsu	1962	2	84	418	3.3	16.3	3.
	Aliyar	Cat. D-7	1959	2	53	821	2.1	33	1
		Cat. D-9	1965	2	1241	1241	50	50	6
	Uttar Pradesh								
22	Yamuna	Cat. D-8	1960	3	540	945	21.6	39.8	2
44	, ,	Euclid C-6	1964	2	682	757	26.3	39.8 30	3 35.
		Komatsu D-80	1970	2	382	382	15	30 15	<i>3</i> 5.
23	. Ramganga .	Cat. D-8	1962	3	57	62	2.3	2.5	2
		Cat. D-9	1969	12	1103	1103	44	44	4.
		-	1963				17	-7-7	***

1	2	3	4	5	6	7	8	9	10
_	Ramganga (contd.)	Komatsu D-80	1969	. 9	965	965	39	39	39
		Euclid TC-12	1964-65	17	832	1079	38.3	43	65
	•	1H-TD-25	1966	10	817	817	90	33	58
		Euclid C-6	1964	14	1207	1196	48	48	73
	West Bengul								
24.	Kangsabati .	Cat. D-8	1957-62	15	483	594	19	24	23
		Cat. D-8	1966	1	714	714	29	29	36
		Komatsu D-120	1968	2	580	580	23	23	26
		Cat. D-7	1961	1	304	• •	12		. 34
		IH. TD-18	1958	3	164	270	7	11	17
		Cat. D-4	1958-60	80	39	141	1.6	5.6	. 4 .
		Cat. D-9	1957	2	335	653	13	26	23
		A.C.H.D5	1955	20	287	287	11	11	22
	CENTRAL GOVERNM		1080	1.0	£25	700			•
25.	Rehabilitation	Komatsu D-80 A. C. H. D21	1959 1965	16 15	635	582	45.3	41.6	54.6
	Reclamation	Cat. D-8	1961	15 45	1118	1118	80	80	110.7
		French RC-10G	1966-67	45 15	684 940	750	49	53.6	54.6
		Tichen Re-100	1700-07	THE T	240	940	67	67	78
	CORPORATIONS	C. 13.9	1065 66		2705				
26.	Neyveli Lignite	Cat. D-8	1965-66	15	2786	••	111.4		120
		Cat. D-9	1958	2	1465	1431	58.6	57.2	74. 4
		Euclid C-6	1965-66	2	1229		61.1		101.5
		Komatsu D-120	1969	5	1767	• •	70.7		77
27.	H.S.L. Rourkela.	TD-24	1959	A KALS	1960	2727	78.4	109	144
		TD-25	1964	1 1 2 1	3100	3017	124	120.7	160
		D-4	1966	2	2360	2360	94	94	170
		Bharat Let	1969 1964	1 3	5700 1375	5700 1375	228 55	228	228
			TEN	मेव जराते			55	55	88
28.	H.S.L. Bhilai .	A.C.H.D. 6	1956	_	108	189	4.3	7.6	14.3
		Do. 21	1956	3	360	780	14.4	31.2	23.5
29.	H.S.L. Barsua Mines	TD-24	1556	3	336	1053	13.4	42	23.3
241	MMDC (Baladila)	Cat. D-9	1967	4	2014	2014	81	81	122
30.	MMDC (Baldana)	TD-25	1964	3	1605	1605	64.2	64.2	
21	NMDC (Kiriburu)	IH. TD-25	1962	O	711	711	28	28	28
,,,	THIRD (ILLINOIS)	Cat. D-9	1967	1	1078	1078	43	43	43
		BEML D-120	1971	3 -	691	691	28	28	28
32.	NMDC (Donamala	ii) D-80	1969	2	1870	1870	75	75	75
33.	N.P.C.C.	TD-25	1965	10	979	948	39	38	65 -5
		Komatsu D-120	1962	18	185	492	7.4	19.6	22.6
		Komatsu D-80	1962	7	452	703	18	28	32
		Komatsu D-50	1963	2	165	393	6.6	16	15.4
		HD-20	1963	3	188	142	7.5	6	31.4
		HD-19	1964	3	67	187	2.7	7.6	2.7
		HD-16	1964	2	119	99	5	4	14
		Russian C-100	1966	2	61	896	2.4	36	8.6
		Emico- C-106	1962-65	2	301	431	12	13.2	35
		Euclid C-6	1962	1	306	553	12.2	22	24.5
		D-8	1964	1	188	42	7.5	2	4.2

1	2	3	4	5					10
34.	N.C.D.C.	. Cat D-8	1963	30		1848		74	100
	11.0.0.0.	Cat. D -9	1963	13		1398	••	56	85
		D-80	1970	5		2326	••	97	135
		TD-25	1961	5	• •	1101	• •	44	58
		TD-24	1956	3	• • •	905	• • •	36	42
Priv	VATE BODIES	12 11	• • • •	••	••	70.7	• •	,	
	II.C.C	Cat. D-8	1965	1	1166	1166	46.6	46.6	61
., ,	H.C.C	Komatsu D-120	1968-69	5	1380	1380	55.2	55.2	72.4
		Cat. D-8	1966	i	1388	1388	55.5	55.5	82
		Cat. D-6	1200	'	1200	1.700	55.5	33.3	02
36.	TISCO .	. IH-TD-25	1967	1	1172	1172	47	47	58
		Cat. D-9	1961-64	3	2520	2070	101	83	144
		IH-TD-25	1963	1	3320	2460	133	98.4	150
		IH-TD-25	1966	2	3320	3320	143	133	150
		IH-TD-25	1967	2	3320	3320	133	133	150
		Komatsu D-120	1969	1	3320	3320	133	133	150
		IH-TD-25	1961	2	3320	2400	133	96	150
Cat	egory of Machine		ENT UTILI	SATION (CATEGOI	RY-WISE)		Appendi	x 2.2.3
SI. No.	State/Project		Year of	No. of	Average	total hours		utilisation	Figure
	or Departm	ent machines	purchase	machines	worked r	er year per	as percen Schedule		of max utilisation
INC.			15578		.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				
140.				hill	During the last five years	Commis-	During the last five years	Commis-	during the five years as
					During the last	date of initial	the last	date of initial	year during
1	2	3	4	5	During the last	date of initial Commis-	the last	date of initial Commis-	year during the five years as percen- tage of
	2 Stati Governmi		4) 	During the last five years	date of initial Commissioning	the last five years	date of initial Commissioning	year during the five years as percen- tage of Schedule
			4	-	During the last five years	date of initial Commissioning	the last five years	date of initial Commissioning	year during the five years as percen- tage of Schedule
1	STATE GOVERNMI Andhra Pradesh	ENTS	स्ट	प्रमेव जयते	During the last five years	date of initial Commissioning	the last five years	date of initial Commissioning	year during the five years as percen- tage of Schedule
1	STATE GOVERNME	ENTS Russian MAZ-525(14) 1966	प्रमेव अवते 9	During the last five years 6	date of initial Commissioning	the last five years	date of initial Commissioning	year during the five years as percen- tage of Schedule
1	STATE GOVERNMI Andhra Pradesh	Russian MAZ-525(14 Euclid B-3-FD (11)) 1966 1964	9 11	During the last five years 6	date of initial Commissioning	the last five years 8	date of initial Commissioning	year during the five years as percen- tage of Schedule 10
1	STATE GOVERNMI Andhra Pradesh	Russian MAZ-525(14 Euclid B-3-FD (11) Euslid B-1-TD(14-18)) 1966 1964	प्रमेव अवते 9	During the last five years 6 157 273 311	date of initial Commissioning 7	the last five years 8	date of initial Commissioning	year during the five years as percen- tage of Schedule
1.	STATE GOVERNM Andhra Pradesh Srisailam	Russian MAZ-525(14 Euclid B-3-FD (11) Euslid B-1-TD(14-18) Mogurt (6)) 1966 1964 1966 1966	9 11 7 4	During the last five years 6 157 273 311 311	date of initial Commissioning	the last five years 8 6 11 12 12	date of initial Commissioning	year during the five years as percentage of Schedule 10 20 14 20 20
1.	STATE GOVERNMI Andhra Pradesh	Russian MAZ-525(14 Euclid B-3-FD (11) Euslid B-1-TD(14-18) Mogurt (6)) 1966 1964 1966	9 11 7	During the last five years 6 157 273 311	date of initial Commissioning 7	the last five years 8	date of initial Commissioning	year during the five years as percentage of Schedule 10 20 14 20
1.	STATE GOVERNM Andhra Pradesh Srisailam	Russian MAZ-525(14 Euclid B-3-FD (11) Euslid B-1-TD(14-18) Mogurt (6)) 1966 1964 1966 1966	9 11 7 4	During the last five years 6 157 273 311 311	date of initial Commissioning	the last five years 8 6 11 12 12	date of initial Commissioning	year during the five years as percentage of Schedule 10 20 14 20 20
1.	STATE GOVERNME Andhra Pradesh Srisailam L.S. Left Canal	ENTS Russian MAZ-525(14 Euclid B-3-FD (11) Euslid B-1-TD(14-18) Mogurt (6) Let D (9)) 1966 1964 1966 1966	9 11 7 4	During the last five years 6 157 273 311 311 242	date of initial Commissioning 7	8 6 11 12 12 10	date of initial Commissioning 9 25.6	year during the five years as percentage of Schedule 10 20 14 20 20 15
1.	STATE GOVERNME Andhra Pradesh Srisailam L.S. Left Canal	ENTS Russian MAZ-525(14 Euclid B-3-FD (11) Euslid B-1-TD(14-18) Mogurt (6) Let D (9) Euclid B-2-TD (11)) 1966 1964 1966 1966 1960 1957 1964	9 11 7 4 4	During the last five years 6 157 273 311 311 242 591	date of initial Commissioning 7 640 224 457	8 6 11 12 12 10 23.6	date of initial Commissioning 9 25.6	year during the five years as percentage of Schedule 10 20 14 20 20 15 23.6
1.	STATE GOVERNME Andhra Pradesh Srisailam L.S. Left Canal N.S. Dam	ENTS Russian MAZ-525(14 Enclid B-3-FD (11) Euslid B-1-TD(14-18) Mogurt (6) Let D (9) Euclid B-2-TD (11) Mogurt (6)) 1966 1964 1966 1966 1960 1957 1964	9 11 7 4 4 4 7	During the last five years 6 157 273 311 311 242 591 401	date of initial Commissioning 7 640 224 457 418	8 6 11 12 12 10 23.6 16	date of initial Commissioning 9 25.6	year during the five years as percentage of Schedule 10 20 14 20 20 15 23.6 23
1.	STATE GOVERNME Andhra Pradesh Srisailam L.S. Left Canal N.S. Dam .	Russian MAZ-525(14 Euclid B-3-FD (11) Euslid B-1-TD(14-18) Mogurt (6) Let D (9) Euclid B-2-TD (11) Mogurt (6) Let D Tournapul (9)) 1966 1964 1966 1966 1960 1957 1964	9 11 7 4 4 4 7 4	During the last five years 6 157 273 311 311 242 591 401 875	date of initial Commissioning 7 640 224 457 418 830	8 6 11 12 12 10 23.6 16 35	9 25.6 9 18 16.7 33	year during the five years as percentage of Schedule 10 20 14 20 20 15 23.6 23 51
1.	STATE GOVERNME Andhra Pradesh Srisailam L.S. Left Canal N.S. Dam	Russian MAZ-525(14 Euclid B-3-FD (11) Euslid B-1-TD(14-18) Mogurt (6) Let D (9) Euclid B-2-TD (11) Mogurt (6) Let D Tournapul (9) Euclid FDT-77 (14)) 1966 1964 1966 1966 1960 1957 1964 1963	9 11 7 4 4 4 7 4	During the last five years 6 157 273 311 311 242 591 401 875	date of initial Commissioning 7 640 224 457 418 830	8 6 11 12 12 10 23.6 16 35	9 25.6 9 18 16.7 33	year during the five years as percentage of Schedule 10 20 14 20 20 15 23.6 23
1.	STATE GOVERNME Andhra Pradesh Srisailam L.S. Left Canal N.S. Dam .	Russian MAZ-525(14 Euclid B-3-FD (11) Euslid B-1-TD(14-18) Mogurt (6) Let D (9) Euclid B-2-TD (11) Mogurt (6) Let D Tournapul (9) Euclid FDT-77 (14) Russian MAZ-525(14) 1966 1964 1966 1966 1960 1957 1964 1963	9 11 7 4 4 4 7 4	During the last five years 6 157 273 311 311 242 591 401 875	date of initial Commissioning 7 640 224 457 418 830	8 6 11 12 12 10 23.6 16 35	9 25.6 9 18 16.7 33	year during the five years as percentage of Schedule 10 20 14 20 20 15 23.6 23 51
1.	STATE GOVERNME Andhra Pradesh Srisailam L.S. Left Canal N.S. Dam .	Russian MAZ-525(14 Euclid B-3-FD (11) Euslid B-1-TD(14-18) Mogurt (6) Let D (9) Euclid B-2-TD (11) Mogurt (6) Let D Tournapul (9) Euclid FDT-77 (14)) 1966 1964 1966 1966 1960 1957 1964 1963	9 11 7 4 4 4 7 4	During the last five years 6 157 273 311 311 242 591 401 875	date of initial Commissioning 7 640 224 457 418 830	8 6 11 12 12 10 23.6 16 35	9 25.6 9 18 16.7 33	year during the five years as percentage of Schedule 10 20 14 20 20 15 23.6 23 51
1.	STATE GOVERNME Andhra Pradesh Srisailam L.S. Left Canal N.S. Dam .	Russian MAZ-525(14 Euclid B-3-FD (11) Euslid B-1-TD(14-18) Mogurt (6) Let D (9) Euclid B-2-TD (11) Mogurt (6) Let D Tournapul (9) Euclid FDT-77 (14) Russian MAZ-525(14) 1966 1964 1966 1966 1960 1957 1964 1963	9 11 7 4 4 4 7 4	During the last five years 6 157 273 311 311 242 591 401 875	date of initial Commissioning 7 640 224 457 418 830	8 6 11 12 12 10 23.6 16 35	9 25.6 9 18 16.7 33	year during the five years as percentage of Schedule 10 20 14 20 20 15 23.6 23 51
1. 2. 3.	STATE GOVERNME Andhra Pradesh Srisailam L.S. Left Canal N.S. Dam . Bihar Tenughat .	Russian MAZ-525(14 Euclid B-3-FD (11) Euslid B-1-TD(14-18) Mogurt (6) Let D (9) Euclid B-2-TD (11) Mogurt (6) Let D Tournapul (9) Euclid FDT-77 (14) Russian MAZ-525(14) 1966 1964 1966 1966 1960 1957 1964 1963	9 11 7 4 4 4 7 4	During the last five years 6 157 273 311 311 242 591 401 875	date of initial Commissioning 7 640 224 457 418 830	8 6 11 12 12 10 23.6 16 35	9 25.6 9 18 16.7 33	year during the five years as percentage of Schedule 10 20 14 20 20 15 23.6 23 51
1. 2. 3.	STATE GOVERNME Andhra Pradesh Srisailam L.S. Left Canal N.S. Dam . Bihar Tenughat . Gujarat	ENTS Russian MAZ-525(14 Euclid B-3-FD (11) Euslid B-1-TD(14-18) Mogurt (6) Let D (9) Euclid B-2-TD (11) Mogurt (6) Let D Tournapul (9) Euclid FDT-77 (14) Russian MAZ-525(14 Russian Belaz-540 (18)	1966 1964 1966 1966 1960 1957 1964 1963	9 11 7 4 4 4 7 4 9 8 30	During the last five years 6 157 273 311 311 242 591 401 875	date of initial Commissioning 7 640 224 457 418 830 1483 752 789	8 6 11 12 12 10 23.6 16 35	9 25.6 9 18 16.7 33 60 31 31.6	year during the five years as percentage of Schedule 10 20 14 20 20 15 23.6 23 51 10 42
1. 2. 3.	STATE GOVERNME Andhra Pradesh Srisailam L.S. Left Canal N.S. Dam . Bihar Tenughat . Gujarat	ENTS Russian MAZ-525(14 Euclid B-3-FD (11) Euslid B-1-TD(14-18) Mogurt (6) Let D (9) Euclid B-2-TD (11) Mogurt (6) Let D Tournapul (9) Euclid FDT-77 (14) Russian MAZ-525(14 Russian Belaz-540 (18) Let West 'C' Pull (17)	1966 1964 1966 1966 1960 1957 1964 1963	9 11 7 4 4 4 7 4 9 8 30	During the last five years 6 157 273 311 311 242 591 401 875	date of initial Commissioning 7 640 640 224 457 418 830 1483 752 789	8 6 11 12 12 10 23.6 16 35 8 31 30	9 25.6 9 18 16.7 33 60 31 31.6	year during the five years as percentage of Schedule 10 20 14 20 20 15 23.6 23 51 10 42
1. 2. 3.	STATE GOVERNME Andhra Pradesh Srisailam L.S. Left Canal N.S. Dam . Bihar Tenughat . Gujarat	Russian MAZ-525(14 Euclid B-3-FD (11) Euslid B-1-TD(14-18) Mogurt (6) Let D (9) Euclid B-2-TD (11) Mogurt (6) Let D Tournapul (9) Euclid FDT-77 (14) Russian MAZ-525(14 Russian Belaz-540 (18) Let West 'C' Pull (17) Let West 'C' Pull (17)	1966 1964 1966 1966 1960 1957 1964 1963 1965 1965 1966	9 11 7 4 4 4 7 4 9 8 30	During the last five years 6 157 273 311 311 242 591 401 875 189 752 758	date of initial Commissioning 7 640 224 457 418 830 1483 752 789	8 6 11 12 12 10 23.6 16 35 8 31 30 8.2 8.2	9 25.6 9 18 16.7 33 60 31 31.6	year during the five years as percentage of Schedule 10 20 14 20 20 15 23.6 23 51 10 42 14 14

1	2	3	4	5	6	7	8	9	10
	Himachal Pradesh								
б.	Beas - 1	Tourna Rocker	1964	16	834	1125	33.3	45	40
		Euclid B-2-TD	1964	9	1516	2056	60.6	82.2	77
		B-14-FD	1967	14	1103	1103	4.1	44	54
7.	Uhl Hydel Stage II	Mogurt DR-50(6)	1963	8	676	734	27.0	29.4	38.0
8.	Giri Hydel	Mogurt (6)	1967	8	520	520	21	21	26
		'C' Pull (17)	1968	Ĺ	1368	1368	55	55	82
	J. & K. STATE								
٩.	J & K Flood Con-	Enelid 94-FD	1961	11	353	650	14	26	27
	trol.	Mack M-18-X (17)	1963	7	468	474	19	19	31
		Mogurt DR-50 (6)	1963	4	72	81	3	3.2	8
	Kerala								
0.	Iddiki	Sicard	1968	12	152	152	6.1	6.1	7.55
		Mogurt DR-50 (6)	1961	22	40	40	1.6	1.6	4
	Madhya Pradesh								
1.	Tawa .	Cat 619-C (20)	1965	4	154	80	6	3.2	19
		Euclid 70-TD (20)	1964	13	233	328	9.3	13	17
	Maharashrta		G. S.						
2.	Mula	Let C Pull (17)	1968	8	1196	1196	47.8	47.8	58
		Cat. (20)	1968	10	644	644	25.8	25.8	29
		Russian Maz (17)	1965	12	647	647	25.8	25.8	43
13.	Koyna Hydel .	Avelin Barford (9)	1956-58	14	543	315	22 32	12.6	61
		Mogrut ()	1966	45	811	811	32	32	115
1 4	Mysore		The state of the s						
1→,	Ghataprabha .	Mogurt (6)	1959-66	.5		558		22.3	48
		Russian (14)	1967	a = 22	• •	146	• •	5.8	11.3
	Orissa								
5.	Balimela	Russian Maz 525(17)	1964-65	50	391	400	16	16	55
		Mack M-25 (17)	1968	7	568	547	22.7	21.8	33
		Cat. DW-20 (17)	1967	16	827		33		44.
		Cat. 630-B (40)	1969	5	2704		108	• •	108
	Punjah					•			
6.	Beas -II	Euclid 36 LTD(40)	1968	12	2584	2584	72	72	81
		Cat. PW-621 (20)	1969	36	3411	3411	6 5.3	65.3	95
		Cat. PW-630 (40)	1969	14	2514	2514	70	70	102
		Euclid B-2TD (18)	1963	11	2626	2712	73.5	75	113
		Euclid 15-FDT (30)	1964	8	3328	2896	93	80	133
		1H. PH-100 (20)	1969	13	3340	3340	134	134	178
7	Uttar Pradesh Yamuna	Large Doll (12)	10/2	12	252	710	• •	20.4	20
		Let. C Pull (17)	1962	12	352	719	14	28.4	20
ð.	Ramganga .	Euclid 36-LTD(40)	1966	13	506	506	20.2	20.2	50
		Cat. PW-630 (40) Cat. 619-C (20)	1968-69 1969	12 14	1029 129	1029 129	41 5	41 5	76 12
		Euclid 70-TD (20)	1964	25	364	934	35	3 37	12 49
						737			7/

1	2	3		4 5	6	7	8	9	10
	West Bengal								
9.	Kangsabati .	Tournapull Super (17)	1962	5	44	70	1.8	2.8	2.1
	GOVERNMENT COR	PORATIONS							
0.	Neyveli Lignite .	Cat. DW-20	1967	10	1696	1669	67.8	67.8	81
		Cat. 630-B	1966	8	2243	2243	90	90	98
		Haulpak LW-35	1969	1	233	233	9	9	9
1.	H.S.L. Rourkela	Leyland	1961	8	166	1584	7	63.4	11
2.	H.S.L. Bhilai .	Mack	1958	4	337	330	13.5	13.2	20
3.	H.S.L. Barusa	Mack	1956	8	930	1307	37	50.7	44
	Mines	Haul Pak	1962	3	930	1161	37	46.4	44
		Haul Pacek	1969	5	930	2188	37	87.5	44
4.	N.M.D.C.	IH-100	1965	18	1425	1425	57	57	64
	Bailadila	Scammel	1968	3	454	454	18	18	30
5.	N.M.D.C.	Euclid 66-TD	1962	18	1097		44		48
	Kiriburu	Euclid 94-FD-7	1969	(3.8)40	1097	1097	44	44	48
		BEML CFA-15-TH	19 69-	70 6	1097	1097	44	44	48
6.	N.C.D.C	Euclid B-ITD	1956	8		716	••	29	36
		B-3-TD	1956	25		987		39	51
		Mack LVX	1956	7 7		631		25	36
		Euclid 46-TD	1959	40		1020		41	71
		Haulpak LW-32	1962	21		1011		40	61
		Mack M-30-X	1965	21	3	1819		73	119
		Euclid 11-LD	1965	15	<i>y</i>	1626		65	103
		MAZ-525	1965	23		822	• •	33	45
		BELAZ-540	1967	24		1958		78	100
		Haulpak LW-35	1969	17		2369	• •	95	157
		Haulpak LW-35	1970	33	• •	1371		55	127
		Euclid B-6-FD	1959	9		841		34	56
		Euclid B-7-FD	1960	39		1006		40	64
		Coal Hauler	1963	14	••	873		35	82
7.	N.P.C.C	Euclid B-94-FD	1962	1	89	686	3.6	27	17.3
		Euclid B-7-FD	1963	2	141	192	6	7.7	12
		Let.	1963	4	540	454	21.6	18	41
		Leyland	1963	17	29	277	1.2	11.1	4.3
		IH-Payhauler Mogurt	1965 1963	10 12	892 77	892 339	36 3	36 13.6	53.4 8.4
			1,05	14	• •	337	3	13.0	0.1
	PRIVATE BODIES								
8.	H.C.C	Euclid 80-FD	1965	14	628	628	25	25	38
		Kolshring -140	1967	8	1199	1199	48	48	74.2
} ,	TISCO	Euclid B-3-FD	1958	7	2800	3000	112	120	120
		Mack M-25-X	1966	7	3350	3350	134	134	144

⁶⁻⁴ CWPC/ND/75

EQUIPMENT UTILISATION (Category-wise)

Category of Machine-Scrapers (Motorised).

Sl. State/Project or No. Department	Description of machine	Year of purchase	No. of machines	Average T hrs. worke per mac	ed per yr.	Average u as %age o	tilisation of Schedule	Figure of Max. utilisation
				During last 5 yrs.	From the date of initial commis- sioning	During last 5 yrs.	From the date of initial commis- sioning	in any yr.during last five years as %age of schedule
1 2	3	4	5	6	7	8	9	10
STATE GOVERNMENTS	<u> </u>							
Andhra Pradesh								
1. N.S. Right Canal	Cat. 62 F.	1963-65	7	560	739	22	29.6	43
		1956-57	6	356	593	14	23.7	29
	A.C.TS360	1961	3	113	323	4.5	12	4.6
2. N.S. Left Canal ·	Let C-(14-18)	1965	12	1111	817	44	32.7	118
	Let. (14-18)	1963	11	557	1696	22.3	44	43
	A.C.T.S. 360	1958	6	84	329	3.4	13	8
	Let. D-Roadster	1958	2	24	50	1	2	4
	Cat. 621-C	1968	FERREN	1276	1414	51	56.6	61
	WABCO-C	1969-70	20	504	917	20	36.7	34
	Cat. 619-C(14-18)	1963-65	15	82	664	3.3	26.6	14
Blhar		6		93				
3. Tenughat · ·	Let	1968	8	932	••	37	37	42
Gujarat			With	Ţ				
4. Ukai · ·	Let. West 'C' (14-18)	1958	9	575	780	23	31	51
•	Euclid B6 FDT(14-18	3) 1957	4	417	411	16.7	16	28
	do	1966	5	417	-	16.7	_	28
	D. W. 15 (16)	1966	5	303		12	·	23.7
	Let. West V. O. old	1966	nerina 8 u	515		20.6	-	38.3
	Let. West V. O. new	1967-68	45	1814	_	72.6	-	73.5
Jammu & Kashmir								
5. J. & K. Flood Control	Let (14-20)	1962	3	527	398	21	16	62
Madhya Pradesh								
6. Tawa	AC-TA-260 (15-20)	1964	6	115	329	4.6	13	12.6
	Let. 5. (14-20)	1965	3	274	320	11	13	30.7
	Cat. 619C.	1965	10	491	540	20	20	29
Maharashtra	-		_			1		
7. Mula · ·	Tourapul(14-20)	1965	6	894	894	35.7	35.7	66.3
	Cat. 619B	1964	5	1496	1694	60	68	73.8
	Euclid B-6FDT	1965-68	4	579	579	23	23	51.8
8. Jayakwadi ·	Cat 619 C	1965	6	1716	1716	72	72	90
	BEME Let. C.	1968	6	894	894	36	36	57
	Let. C.	1960	7	420	466	17	18.6	23
16	Euclid Bish	1960	3	780	630	31	25	41
Mysore 9. Ghataprabha •	Terra Cobra.	1950-54	2		160		6.4	0.4
> Ouerahianist .	LWB-70 (25)	1950-54	3	••	160 664	••	26.6	8·3 33·1
	L.W.CBull	1965-69	8		992	• •	26·6 40	68 33.1
Rajasthan		1750 07	J	••	112	• •	70	00
10. Rajasthan Canal	Euclid 320 HP(18-22)	1961	5	590	542	24	21.7	36
.v. Kajasman Canal	Eucha 320 FP(18-22)	וסעג	כ	290	342	44	21.1	38

1	2	3	4	5	6	7	8	9	10
Tamil Nadu									
11. Parambi	ikulam								
Aliyar	•	· Cat. DW-20	1961	9	750	1360	30	64 • 4	37.4
		Cat37-C	1961	1	247	1360	10	64 • 4	22.4
		Cat. 67-C	1959	4	563	1228	22.5	49	40
		LW-B. 70 (25)	1965	5	367	381	15	15	24
Uttar Prades	sh								
12. Ram Ga	anga	· LW-B70	1964-65	33	226	470	9	18.1	15
West Bengal	!								
13. Kangsab	ati	· Let Tournapul	1965	4	287	287	11	11	22
		Cat. DW-21	1957	13	676	926	27	37	33
		Cat. 621	1968	6	2715	2715	109	109	112
Governmen	т Corpo	RATIONS;							
14. H.S.L. E	Bhilai	AC-TS-360	1956	8	137	451	5.5	18	11-1
		Let. 'C'	1956	7	57	513	2.3	20.5	3.9

APPENDIX 2.2.5.

EQUIPMENT UTILISATION (Category-wise)

Name of Machine-Cranes

S. No.	State/Project or Department	Description of machine	Year of purchase	No. of machines	Average to worked per machine		Average u as percent schedule		Figure of Max. uti- lisation in
			(During the last 5 yrs.	From the date of initial comsng.	During the last 5 yrs.	From the date of initial comsng.	any yr. during last 5 yrs as % age of schedule
1	2	3	4	स्यमेव ज्	यते 6	7	8	9.	10
						<u></u>			
STATE	GOVERNMENT								
Andhi	ra Pradesh								
1. S	risailam · ·	Lima truck mounted 25T	1966-68	2	381	381	15	15	40
2. N	I.S. Right Canal	C-13 Jones, 6.5T	1966	1	371	442	15	18	22
_		C-14 Cat. T	1958	1	371	116	15	5	22
3. N	I.S. Left Canal	Lima 20T	1968	1	571	••	23	••	24
		Bucyrus Erie 7.5 T	1960	1	178	70	7	2.8	10
4. N	I.S. Dam · ·	Lorain 182, 10T	1959	1	125	218	5	8.7	8
••		I.H. Super-BMD. 5T	1957	2	168	402	57	16-	Ū
1	Delhı :								
5. B	adarpur · ·	Tata P&H 75 T	1968	1	533	533	21	21	32
T	hermal Power ·	-do- 35 T	1968	1	400	400	16	16	32
P	roject · ·	Coles 12.5T	1969	1	567	567	23	23	32
		-do-	1968	1	500	500	20	20	32
J	'ammu & Kashmir								
6. F	lood Control ·	R.B. 15T	1962	2	156	188	6	7.5	11

1	2	3	4	5	6	7	8	9	10
Ker	·ala								
7. Idd		Link Belt	1968	1	152	152	6	6	10
	dhya Pradesh								
8. Tav	va · ·	Coles 10 tons Buckey 5 tons	1962 1966	1 1	34 17	255 17	1.4	10	2.9
		Buckey 3 tous	1900	1	17	17	0.7	0-7	2.2
Ma	harashtra								
9. Mu	ıla · ·	Coles 12.5T	1967	1	591	591	23.6	23.6	32.5
17.									
	sore	Color	1069	1		246			
10. Gh	ataprabha ·	Coles	1968	1	••	346	• •	14	14
Uii	ar Pradesh								
1. Yaı	muna · ·	Fowler I.H.	1960	1	187	193	7.5	8	13
		Link Belt	1962	1	33	• •	1.3	• •	2.4
2. Rai	mganga · ·	Coles S-1210 10T	1964	6	226	387	9	15	15
		Lime 100 Tons	1966	1	559	559	22.3	22.3	43
		Manitowac	1968	1	517	517	20.7	20.7	20.7
We	st Benga!			CIRILLY.					
		Lima K-58	1961	2 2	103	302	4	12.0	12
			Chill.		9				
CE	NTRAL GOV	ERNMENT	(3)						
	jasthan Atomic		1955		804	804	32	32	£ 7
	wer Project	P&H-955	1955		908	908	36	36	57 71
	., 42 - 2-3	Bucyrus	1968	Liller	1227	1227	49	49	56
		Coles Anneas	1965		1396	1396	56	56	78
is Ma	dras Atomic	Coles Anneas	1967		502	502	20	20	24
	wer Project ·	Bucyrus 25-B	1968		205	205	8	8	17
		P&H-955-A	1968	मेव जमते	370	370	15	15	24
GO	VERNMENT	CORPORATIONS							
	yevli Lignite		1959-62	4	4364	3037	174.5	112*5	189-
0. 140	your Diginic	Let. D-10-T	1960-63	4	3413	2839	136.5	113.6	139.
		P&H-955-A-75-T IH-Fowler-5-T	1961 1966	2 8	1965 2567	1188 2732	68 103	57·6 109·3	102 112
, u c	S.L.Rourkela	· Lima-12-T	1963	1		2971		118	_
H. H.S	5.L.Rourkeia	Lima 75-T	1968	î	••	3600	***	144	
		P&H-255	1963	1	2680	2857	107	114	128
		P&H-255	1959	1	1520	2682	61	107	88
		Demag 7-T	1959	1	1040	1817	42	72	64
		P&H-655-B/27T	1964	3	1108	1009	44	40	88
		P&H-155	1965	3	1080	946	43	38	76
		Coles 10-T	1964	1	500 750	508	20	20	52
		Coles 45-T	1965	2	750	640	30	26	42
- E . H.S	S.L. Bhilai 🕠	Coles	1958	5	150	670	6	27	12
		Limca 24-W	1956	4	480	900	19.2	36	38-4
		Limca 604	1956	5	680	1062	27.2	42.5	34 - :
		MOTT BEE AMO							
		P&H 255-ATC	1957	2	952 253	1130	38·1	45·2	53.5
		P&H 255-ATC P&H655-B P&H 655-BLC	1957 1959 1958	2 4 3	253 550	916 875	10, 22	45·2 36·6 35	33·; 30 32

1	2	3	4	5	6	7	8	9	10
		Russian Track	1958	3	195	660	7.8	26 · 4	13 - 2
19. N.C.I	D.C. ·	· EKG 4 Russian	1962	2		1466		59	70
		EKG 6 Russian	1963	7		1703		68	109
		EKG 6 Russian	1965	2		2003		80	82
		EKG 6 Russian	1966	5		3157		126	149
		EKG 8 Russian	1963	4		1341		54	73
		P&H 955-A	1957	8		1001		40	48
		Lorain L-85	1959	8		1004		40	51
		Lima 803	19 5 6	1		1174		47	47
		Tata P&H 955-A	1965	6		2044		82	143
		W/Dragline	1960	2		2880		115	128
		P&H 1855	1959	2		1672		67	76
		Marion D/L 7800	1960	2		1848		74	148
		Marion D/L 7400	1963	1		3337		134	134
		Russian ESH 4/45	1963	2		1029		41	49
		Russian	1963	1	••	509	• •	20	20
PRIV	ATE BO	DIES							
20. H.C.C	<u>.</u>	- Galion	1967	2	1286		51 - 4		80
	•	Hincon (fixed)	1969	4	1276		51	• •	103 · 6
21. TISC	· c	· Lima 15-T	1952	201	2400	2400	96	96	96
		Hyster KE	1955-58	3	2220	2250	88.8	90	96
		Coles 710	1958	3	2500	2583	100	103	100
		Coles 1210	1959	2	9	2520		100	
		Tata P&H 35-T	1967	1	y	3000		120	
		Р&Н 655-В	1958	2	2500	2300	100	92	100
		P&H 655-B	1967	13 55 5	2500	2500	100	120	100

APPENDIX 2.3

COMPARISON OF THE CAPITAL INVESTMENT AND THE END COST OF WORKS BY OPERATING MACHINES IN SINGLE, DOUBLE AND THREE SHIFTS — (A TYPICAL EXERCISE).

Operation with

Excavators & Dumpers

Quantity of work

— 6 M. Cu. m.

Period

— 6 years

Quantity per year

— 1 M. Cu. m.

Cost of 2 Cu. Yds. Shovel

-- Rs. 10 lakhs.

Cost of 25-T Dumper

Rs. 5 Lakhs.

Depreciation in declining balance method (Appendix 8.4) Repair Expenditure as a percentage of cost (Appendix 8.7)

												Single Shift Operation	Double Shift Operation	Three Shifts Operation
Utilisation hours •										•		1200	2000	2500
Quantity/hour in Cu	ı. m				•	•	•	•	•	•	•	835	500	400
Shovel Dipper Yd.		•	•	•		•	•	•	•	•	•	14.0	8.3	6.7
No. of Shovels 2.5 c	u. y	ds.	capaci	ty	•	•		•	•	•	•	5-6	3.32	12.68
Dumpers 25-T @ 5	per	shov	/el		•	•		•	•	•	•	28.0	16.6	13.4
Investment • •		•	-	•	•	•	•	•	•	•	•	$5.6 \times 10 + 28 \times 5 = 196.0$	$3.32 \times 10 + 16.6 \times 5 = 116.2$	$2.68 \times 10 \\ +13.4 \times 5 \\ =93.8$
Ratio .		•	•	•	•	•	•	•	•	•	•	1	0.6	0.48
End Cost •		•	•	•	•	•	•	•	•	•	•	373-00	303 - 00	295.00
Ratio		•	•	•	•	٠	•	•	•	•	•	1	0.816	0.79

OWNING & OPERATING COST SINGLE SHIFT OPERATION

Shovels						
Ownership Cost						
Dep. in 6 years at 15% · · · · · · · ·			•		6,22,850	•
Interest in 6 yrs at 6% of average annual investment • • •		•	•	•	2,49,140	
for 5,6 machines	_				8,71,990	40.02.144
101 3.6 machines	·	•	•	•	_	48,83,144
Operating Cost						
Repair expenditure 25% · · · · · · · · ·	٠	•	٠	•	2,50,000	
P.O.L.	•	•	•	•	3,20,760	
Labour · · · · · · · · · · · · · · · · · · ·	•	•	•	•	70,000	
for 5.6 machines converted to present worth at 6% interest			_		6,40,760	20.22.070
tor 5.6 machines converted to present worth at 676 mercest		Total:	-	-		29,23,878
		TOTAL:				78,07,002
Dumpers						
Ownership Cost						
Dep. in 6 yrs. at 20% · · · · · · · · · · · · · · · · · · ·	•	•	•	•	3,68,928	
Interest in 6 yrs. at 6% of average annual investment • • •	•	•	•	•	1,10,678	
C 20 D					4,79,606	
for 28 Dumpers • • • • • • • • • • • • • • • • • • •	•	•	•	•		1,34,28,980
Operating Cost						
Repairs expenditure at 40% · · · · · · · · · · · · · · · · · · ·		•			2,00,000	
P.O.L. · · · · · · · · · · · · · · · · · ·	٠	•		•	2,85,120	
Labour					36,000	
For 28 Dumpers converted to present worth at 6% interest			•	•		1,18,89,624
Tyres two replacements converted to present worth · · ·						41,06,794
	To	tal:				2,94,25,398
Total expenditure at present worth for Single Shift Operation						3,72,32,420
						-,,- <u>-,</u> -,,
Shovels						
Ownership Cost						
Dep. in 6 yrs. at 20%	٠	•	•	•	7,37,856	
Interest in 6 yrs. at 6% of average annual investment · ·	•	•	•	•	2,21,357	
for 3.32 machines · · · · · · · · · · · · · · · · · · ·	•	•	•		9,59,213	31,84,586
Operating Cost						
Repairs at 40% · · · · · · · · ·	•	•	•	•	4,00,000	
P.O.L. · · · · · · · · · · · · · · · · · ·	•	•	٠	•	5,34,600	
Labour	٠	•	•	•	1,40,000	
4 44 4					10,74,600	
for 3.32 machines converted to present worth at 6% interest .	•	•	•	•		29,05,459
						60,90,045

OWNING & OPERATING COST DOUBLE SHIFT OPERATION

DOUBLE SHIFT OPERA	ATION		
DUMPERS			
Ownership Cost			
Dep. in 6 yrs. at 25% · · · · · · · ·			4,11,011
Interest in 6yrs. at 6% of average annual investment · ·		• •	98,643
For 16 16 months			5,09,654
for 16.16 machines · · · · · · · · · · · · · · · · · · ·	• •	•	84,60,2
Operating Cost			
Repairs at 75% · · · · · · · ·			3,75,000
P.O.L.	• •	• •	4,75,200
Labour	• •	• •	72,000
			9,22,200
for 16.6 machines converted to present worth at 6% interest.	• •	• •	1,24,73,9
Tyres 3 replacements converted to present worth · · · ·	• •	• •	32,59,7
			2,41,93,9
Total expenditure at present worth for Double Shift Operation	•	• •	3,02,84,0
OWNING & OPERATIN	NG COST		
DOUBLE SHIFT OPER	RATION		
	3		
Shovels Our white Cost	P		
Ownership Cost			
Dep. in 6 yrs. at 25% · · · · · · · · · · · · · · · · · · ·			8,22,022 1,97,285
incolose at 5 % in 5 yes. (if avolage attitual investment			
for 2.68 machines · · · · · · · · · · · · · · · · · · ·			10,19,037 27,31,7
Onwelling Cod			
Operating Cost			
Repairs at 60% · · · · · · · · · · · · · · · · · · ·			6,00,000 6,70,000
Labour			2,10,000
			14,80,000
for 2.68 machines converted to present worth at 6% interest.	• •	• •	32,32,0
			59,63,7
Dumpers			
Ownership Cost			
Dep. in 6 yrs. at 30% · · · · · · · · · · · · · · · · · · ·			4,42,000
Interest in 6 yrs. at 6% of average annual investment			88,400
The same of the sa			5,30,400
for 13.4 machines · · · · · · · · · · ·		• •	71,07,
Operating Cost			
Repairs at 100% · · · · · · · · ·			5,00,000
P.O.L.			5,94,000
Labour · · · · · · · · · · · · · · · · · · ·	• ••		1,08,000
			12,02,000
for 13.4 machines at present worth	• •	• •	1,31,24,40
Tyres for 4 replacements at present worth · · · · ·	• •	• •	32,72,4
			2,35,04,30
Total expenditure at present worth for Three Shifts Operation			2,94,68,0

IDENTIFICATION OF STAND BY COMPONENTS FOR 10 NOS, D-8 H POWERSHIFT TRACTORS

APPENDIX 2.4

2 نے	Part No	Description of items	Rate		Total qua	ıntity & Am	Total quantity & Amount as per number of shifts	er of shifts	
į			Rs.	Qty. for I shift	Amount Rs.	Oty. for II Shift	Amount Rs.	Qty. for III Shift	Amount Rs.
[2	3	4	5	9	7	8	6	10
7.	9H4625	Radiator Group, includes core assembly top & bottom tanks	14,257.64		14,257.64	-	14,257.64	2	28,515.28
2.5	5M3990	Water Pump	2,688.68	1	2,688.68		2,688.68	7	5,377.36
	8S6476	Turbocharger Assembly	9,375.56	-	9,375.56	7	18,751.12	7	18,751.12
4.	:	Service Cylinder Head Assembly complete with valves, springs, rotators, chamber assembly, etc.	7,908.15	7	15,816.30	4	31,632.60	4	31,632.60
5.8	8A2391	Service Meter Group	591.78	1	591.78	7	1,183.56	7	1,183.56
6. 5	SM7625	Fuel Transfer Pump Group	1,117.28		1,117.28	73	2,234.56	က	3,351.84
7.	:	Fuel Pump Service Group complete with pump assy, bolts, clamps, etc.	7,996.85	<	7,996.85		7.996.85		7,996.85
	1P9340		4,464.65	Charles Control	4,464.65	7	8,929.30	7	8,929.30
9,	4S9503	Diesel Engine complete with 24v electric starter motor and alternator	1,91,608.65	1	1,91,608.65	***	1,91,608.65	7	3,83,217.30
10. 3	3S4463	Starter Group (24v)	5,137.97		5,137.97	7	10,275.94	ю	15,413.91
11. 2	2S308	Fuel Priming Group	334.51	1	334.51	1	334.51	==	334.51
12. 5	5S9088	Alternator Assembly	4,134.30		4,134.30	2	8,268.60	8	12,402.90
13. 1	1T670	Torque Converter	16,718.03		16,718.03	-	16,718.03	2	33,436.06
14. 1	1S8754	Universal Joint Assy.	2,356.95	1	2,356.95	7	4,713.90	3	7,070.85
15. 2	2S7901	Transmission	1,04,131.56	-	1,04,131.56	 1	1,04,131.56	7	2,08,263.12
16. 5	5M6701	Oil Pump Group (Steering clutch & trans, Lub.	2 500 10	-	2 500 10	r	5 018 30	ŗ	5 018 20
17. 2	2S7873	Scavenge & Recirculating Pump Group (parts	01.600,7	.	2,505.40		0,010.20		2,010.20
18.	5M8764	of torque converter)	2,455.15 22,02.80	- ~	2,455.15 4,405.60	C1 4	4,910.30 8,811.20	67	4,910.30 13,216.80
	5H1719	Pump Group (Final Drive)	961.13	2	1,922.26		1,922.26		3,844.52
20.	:	Idler Assembly, complete with shaft, bushing Assembly, seal group, collar etc.	8,421.94	6	16,843.88		33,687.76		33,687.70
21. 9	9H6449F	Trank Roller Group (single flange)	2,231.12	9	13,386.72	12	26,773.33	-	40,160.16
22. 9	9H6451F	Track Roller Group (double flange)	2,357.70	∞	18,861.60	16	37,723.20	24	56,584.80
	8M380	Track Carrier Roller Group	1,331.39	4	5,235.56	∞	10,651.12	12	15,976.68
. , 24.	7S9116F	Track Group 41 sections and 24" Extreme Service Shoes)	31,440.70	7	62,881.40	4	1,25,762.80	4	1,25,762.80
			GRAND TOTAL		5,09,321.98		6,79,985.78		1,06,038.58
J	Cost of compon	Cost of components as percentage of cost of Tractors.			7		6		13

STATEMENT SHOWING THE VALUE OF STOCK (SPARE PARTS) RECEIPTS, ISSUES AND BALANCES

(Value in Rs. Lakhs.)

SI. No) .		Year					Value of opening Balance	Value of Stock Receipts	Value of Stock Issue	Value of Balance Stock	Value of New Ma- chines purchased	Value of total m/cs in hand
1	·				2			3	4	5	6	7	8
1.	Beas P	rojeci	Unit	II:									
	1965	•	•	٠	•			83.89	66.01	50.72	96 ·19	55.84	153.0
									43 · 1 %	33.1%	62.9%	, ,	
•	1966	•	•	٠	•	•		96 · 19	87.80	50.82	138 · 17	30.32	183.3
								62.9%	48%	27.7%	75.5%		
	1967	•	•	•	•	٠	•	138 · 17	115.97	55 · 54	198 60	7 · 27	190.6
								75.5%	60.8%	29.14%	104 · 18 %		
	1968		•	•		•		198.60	215.32	93.09	320.82	98.48	289.0
								104 · 18%	74.5%	32.19%	110.9%		
	1969	٠	•	•	•		•	320.82	191.01	126.47	385-36	544.59	833 · 6
								110.9%	23.03%	15.2%	46.2%		
	1970	•	•		٠	•	•	385 · 36	7 8 · 75	85.45	378 · 67	83.97	917.6
								46.2%	8.56%	9.13%	41.2%		
2.	Rajasth	an C	'anal F	rojeci	:			(delin)					
	1966	•				•	•	81.7	33 · 1	22.3	92.5	: •	416•
								19.7%	8%	5.3%	22.3%		
	1967		•			•	•	92.5	13.2	16.3	89.4		416.
								22.3%	3.2%	4%	22%		
	1968	•	•		•	٠	•	89 · 4	19.8	7.3	101.9		416
								22%	4.8%	1.8%	24.5%		
	1969	•	•	•	•	•	•	101.9	9.4	8.1	103 · 2	• •	416.
								24%	2.3%	2%	25%		
	1970	•	•	•	٠	•	•	103.2	17.5	18	102.7		416.
								25%	4.1%	4.3%	24.8%		
	Farakk	a Bai	rage 1	Projec	t:								
	1968-69	9	•	•	٠	•		45.73	31.01	12.72	64.02		342 • 4
									9%	3.7%	18%		
	1969-70)	•	•	•	٠	•	64.02	20.61	12.63	72.00		342 · 48
								18%	6%	3.6%	21 %		
	1970-7	1	•	•	•	٠	٠	72.00	22.48	13.83	80.65		342 · 48
								21%	6.5%	4%	23.7%		

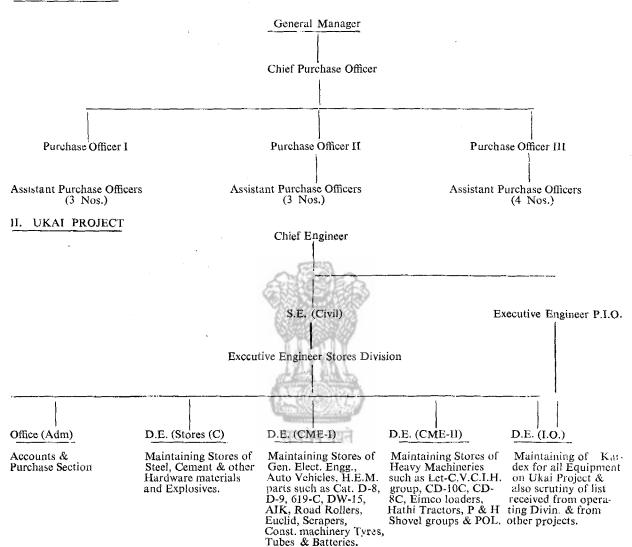
7-4 CW & PC/ND/75

1			2				3	4	5	6	7	8
4.	Ramganga .	Project	;									
	1966-67	•			•	•	130	68	10	188	221 - 92	409 · 92
								16.5%	2.4%	45.8%		
	1967-68	•	•	•	•	•	188	115	27	276	5.01	414.93
							45.8%	27.7%	6.5%	66.5%		
	1968-69		•	٠		•	276	209	78	407	123 · 70	538 • 63
							66.5%	39%	14.4%	75.5%		
	1969-70	•	•	•	•	•	407	194	121	480	176 · 71	715 · 34
							75.5%	27.1%	16.9%	67.1%		
	Ukai Projed	ct:										
	1966-67	•					54.00	113.3	45	122-3	170.75	494-46
								22.6%	10%	25%		
	1967-68	•					122.3	157.5	59.3	220.5	161.35	565 · 81
							25%	24.3%	9%	33 %		
	1968-69		٠	•.	•	•	220.5	197.6	174 - 8	243 · 3	90.26	746-07
							33%	26.5%	23%	33%		
	1969-70				•	•	243 · 3	151 · 7	187.5	207 · 5	78 · 87	824-94
							33%	18.4%	23 %	25%		
	1970-71	•	•	•	•	•	207 · 5	161-4	168.7	200-2		824 · 94
							25%	19.5%	20%	24 %		

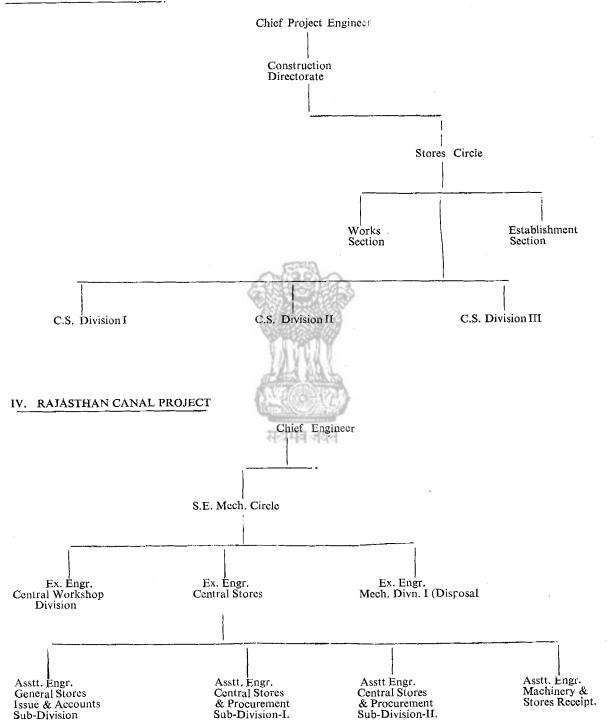
सन्यमेव जयते

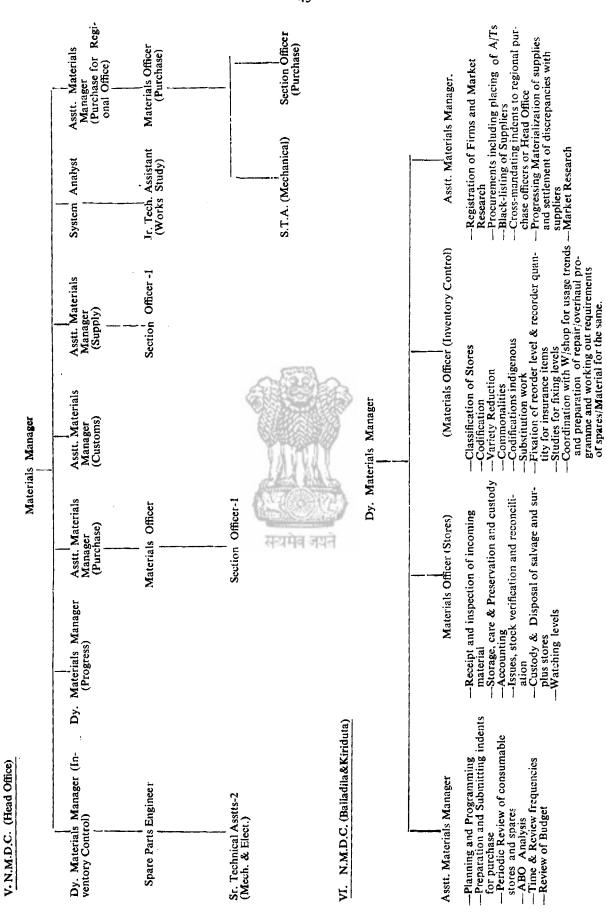
ORGANISATION SET UP WITH SOME USERS OF EQUIPMENT

I. BEAS PROJECT



II. RAMGANGA PROJECT





USE OF KARDEX CARDS FOR INVENTORY CONTROLS

There are two main cards for record keeping of inventory. The *stock card* reflects the day to day transactions of the items and generates historical data for inventory control. The history card stores the consumption and other data in a condensed form. The details are given below.

- A. Stock Card—see specimen. The various columns are filled as below;
 - 1. Card No.—Cards for each item are numbered to simplify filling after they have been completely filled. The suffix A is used for the front side and the suffix B for the back side, such as 1A, 1B, 2A, 2B etc.
 - 2. Sources of Supply—The source from which replenishment stocks are to be ordered.
 - Lead Time—The average number of months required to replenish stock (including a safety margin) as explained later.
 - 4. Maximum Level—The maximum number of pieces that should be on hand and on order at any given time.
 - 5. Minimum—The average number of pieces required to satisfy projects demands during the load time period.
 - 6. Part No.—Stock Record Cards are usually filled in drawers or boxes after they are removed from the active file. Part numbers are placed on the top of the card to simplify filling.
 - 7. Date—The date of such transaction.
 - Reference—Information which will identify each transaction, such as; purchase order numbers, sales order numbers etc.
 - 9. On Order-Quantities ordered.
 - 10. Receipts-Quantities received.
 - 11. Issues-Quantities ordered by customers, Branch stores, service or sales Departments etc.
 - 12. On Hand—The number of pieces currently in the parts store-room ready for sale.
 - 13. Due Project—The quantity unfilled against the demand from the project.
 - 14. Total Available—This column is one of the most important features of the Stock Record Card. This feature, often lacking in other systems, is invaluable for accurate, realistic control since it reflects the sum of the quantities on hand and on order which is essential for proper ordering.

When the amount in this column reaches the minimum established, additional stock should be ordered.

The figures in this column serve to verify the accuracy of issue and receipt postings, because the total of the figures in the On hand and On order columns should always equal the Total Available figure. When these figures do not agree, a posting error has been made and the card should be audited and corrected promptly.

- 15. Total Demand—An accumulation of the total demands of customers for three month periods. At the end of each calendar quarter the final figure is transferred to the History Card. This climinates considerable clerical work spent totalling individual figures at the end of each quarter.
- 16. Part No.—The number of the part being controlled.
- 17. Name—The Numerical parts Record name of the part being controlled.
- 18. Cost Price—The price per unit including tax etc.

History Card—see specimen. The following information is recorded on History cards;

- 1. Part No.—The part number in this space is used to simplify filling when cards become inactive.
- 2. Part No.—The number of the Part bein gcontrolled.

- 3. Description-The Numerical Parts Record name of the part.
- 4. Where Used—That portion of a machine (transmission, final drive, oil pump, etc.,) on which the part is used. This information may be obtained from column No. 4 of the Numerical Parts Record.
- 5. Replaces—Part number or numbers of preceding part or parts, provided the part being controlled replaces a former part or parts. (replaces means completely interchangeable).
- 6. Replaced By—The new part number, provided the part being controlled has been replaced.
- 7. Used On—The various sizes and models of machines on which the part is used.
- 8. Net Weight-The weight of the part.
- Quantity Per Package—The number of pieces included in each package as indicated in the Numerical Parts Record.
 This enables project to place orders for packaged quantities.
- 10. Remarks-Miscellaneous information such as Import Duty Rates, Import Commodity Classifications etc.
- 11. Yearly Consumption—The historic record of past demand. Total demand is recorded each quarter—the information being obtained from the Total Demand column on the related Stock Record Cards.

This record of quarterly and yearly demand, while serving as the basis for establishing proper Minimums, also provides information of sales trends so necessary for forecasting stock requirements.



FRONT SIDE

CARD	
HISTORY	
B_HIS	

8-				B-HISTORY CARD	RD				
4 CV								BA	BACK SIDE
V & PC					,	Part No. (1)		:	
DA Part No. (2)		Description (3)							
Replaces (5)		Replaced by (6)							
Where used (4)			4	No. Used					
Net weight LB (8)		Qty. per package (9)			Commodity No.	No.			
Remarks (10)			IA Veri		0			*	
			्रिट्ट व जयते						
	r	Yearly Consumption (11)	}						
19	19	19	19	19	61	19	19	19	19
1st Qtr.									
2nd Qtr.		-							
3rd Qtr.				-					
4th Qtr.									
TOTAL									

KARDEX RECORD FOR PROTECTIVE ITEMS

The record for protective spares is kept in two types of cards as below, at Central Inventory Control:

- (a) Equipment specifications card 1A (Front) and 1B.This contains details of particular type of equipment such as D7, or D6 Bulldozer etc. in each project area.
- (b) Protective items cards—2A & 2B. The number of points of use at each project, the number of assemblies and sub-assemblies, their physical location (they may be in any of the project sites but reserved for CIC) etc.

 The cards are self-descriptive.

DETAILS OF THE EQUIPMENT AT VARIOUS PROJECTS

1A Front Side.

Project	Nos. including stand by	Manufacturers Serial Nos. (Major Unit)	Year of purchase	Specific features, if any	Project's specifi- cations sheet Nos.
				e e e e e e e e e e e e e e e e e e e	
		14. 14.21	ेन्द्रिक व जयने		
Total			Card prepared on		
Units	•		Revised on		*****
		EQUIPMENT 1A Front Side	SPECIFICATION (CARD	

			1B back side
SUPPLIERS		····	
CATALOGUE REF	FERENCES		
ANY OTHER USER	FUL INFORMATION; (De	etails of drive belts, cross reference of	card numbers of connected machinery
	EQUIPMEN	Fold here IT SPECIFICATION CARD	
MAKE(Major Unit)		TYPE (Major U	nit)
		VANOVA	
H.P.	SIZE	OUTPUT	
MAKE OF SUB UN	NITS (Engine, Motor, Gear B	Box etc.)	TYPE OF SUB UNITS
DESCRIPTION		78	USED FOR
CARD NO	STORES REF.	NAME OF MACHI	NERY
		SPECIFICATION CARD Back Side	
	RECORD	S_OF_RECEIPTS AND CONSUMI	2A Front Side
Date Ref. No.	RECEIPT QTY. VALUE	CONSUMPTION QTY. VALUE	POOL BALANCE QTY. VALUE

... Fold here

CENTRAL INVENTORY CONTROL CARD

INDENTED	PUR	CHASE ORE	ER	j	RECEIPTS	SUPPLIERS
Date Indent Qty. No.	Date	Order No.	Qty.	Due Date	Date (Qty.
DRAWING OR PART	NO.	SF	ECIFICA	ATION		
REF. No. UNIT ESP/	Al	PPROX,	UNI	COST	RS	MPORTED/INDIGENOUS
- -	DESCRIP	TION				
			500	CY STOC	K CARD	
		ST	оск	PARTIC	JLARS	(2B Back Side.)
PROJECT			1//	NAT		
No. of points of use.				LINE AND A		
Allocation			(demand			
CIC Stock on			सदारे	व जयते		
LATEST STOCK POSI- TION AND MOVEMEN PARTICULARS.	ΝΤ					
	·*·		(Fold	here)		
PROJECT				when v		
No. of points of use						
Allocation			·			······································
CIC Stock on					· · · · · · · · · · · · · · · · · · ·	
T—Transfer C—Consumed R—Receipt						
Latest pool Stock from Date						
		CIC E	MERGE (2B Ba		CK CARD	

Appendix 5.1

ABSTRACT OF REQUIREMENTS DURING THE 5TH PLAN

	Departmen	t							Nos.	Value in Rs. lakhs.
1.	Irrigation and Power Sector .			•		•	•		2731	13894.40
2.	Govt. Undertakings/Corporations		٠.					•	. 718	7789.25
3.	Other Government Departments		•		•				178	366.90
4.	Private Bodies	٠	•						79	381.25
	Grand Total		•			•	•		3706	22,431.80

Note; -Details may be seen on subsequent pages.

1. IRRIGATION AND POWER SECTOR

	Equipment & Capacity	Requirement in Nos.	Cost Unit	Value in Rs. lakhs.
	i	2	3	4
1.	ANDHRA PRADESH			
	Krishna Godavari Delta Drainage Scheme.	WHO SHOP		
	Dredgers 11"	. YA (TU 43)	80.00	240.00
	18" Cutter Suction Dredgers		90.00	180.00
	Grab Dredgers 2.5 Cyds		80.00	240 . Ot.
	P.W.D.C.E. Major—Irrigation Hyderabad.	Charles Control		
	Komatsu D-120 250 H.P	. 12	6.00	72.00
	Tractor/Dozer	প্রভাগনার নাবর	4.00	4.00
	Scraper 14 Cyds	. 9	6.00	54.00
		30		790 .00
	Scrapers (M)	. 30	6.00	180.0
	Tractors 175 H.P.	10	4.00	40.0
	Water Tanker 1000G	. 8	0.70	5.0
	Tractors 175 H.P.	. 6	4.00	24.0
	Shovels 2.5 Cu. Yds	. 2	10.00	20 υ
	Dampers 14.8 Cu. Yds	. 8	6.00	48 0
	Motor Graders 115 H.P	. 2	2.50	5 4
	Tractor/Dozer 130. H.P	. 2	2.50	5.6
	Mucking M/C	. 1	2.00	2 (a
	Tractor (Cr.) 60 H.P.	. 2	1.00	2 0
	Tractor (Cr.) 60 H.P	. 2 . i	1.00 6.00	2 (n 6 de

	1				2	3	4
3.	GUJARAT						
	Kadna					•	
	Tractor Bull Dozers	_			. 80	2.50	700 0
		•	•	•	, 60	2.30	200.0
	Ukui						
	Tractor Bull Dozer 100 F	I.P.	•	•	. 150	2.50	375.00
					230		575.00
i .	HARYANA						
	W.J.C. Augumentation						
					6	10.00	
	Draglines 2.5 cu. yds.		•	•	. 6	10.00	60.0
	Tractors		•	·	. 8	8.00 6.00	16.0
	Tractors (Cr.)				. 40	6.00	48.00
	Graders		·		. 2	2.50	240.0 6.0
	Trailers				. 1	3.00	3.00
	Gantry Crane				2	2.50	5.00
						4.00	3.0
	Yanımuna Barrage Division				Col381-0		
	Tractors	•	•	•	2	2.50	5.00
	Mech. Drainage Div. Karnal	•					
	Dragline 1.5 cu. yds.	•	•	•	4	6.00	24.00
	Tractors 100 H.P	•	•	•	. 2	2.50	5.00
	Motor Grader .	•	•	•	72/14/8/16/3	2.50	2.50
	Tr. Trailer 30/45 T.	•	•	•	. 2	3.00	5.00
					72		419.50
i.	HIMACHAL FRADESH				सन्यमेव जयने		
	Baba Hydro (E) Project.						
	Shovels				. 8	10.00	80.00
	Loaders (Cr.)			• •	. 12	3.00	36.00
	Do. (Wh.)		•	•	, 6	3.00	18.00
	Dumpers (R)		•	•	. 32	6.00	192.00
	Graders	•	•	•	. 4	2.50	10.00
	Batching & Mixing Plant	•	•	•	. 4	12.00	48.00
	Transit Mixer	•	•	•		4.00	120.00
					96		504.00
					and the second s		
	KERALA						
	K.I.P. Thenmela.						
	Tractors (Cr.) 100 H.P.				. 1	2.50	2.50
	Pn. Tyred Tractor .				. 1	0.80	0.80
					. 1	2.00	
	Tractor 80 H.P.	•	•	•	-	4.00	2.00
	Tractor 80 H.P. Tractor 120 H.P.				. 1	2.50	2.00 2.50

 1					2	3	4
Idikki hydro							
Shovel 2.5 cu. yds.						10.00	10.0
Tractor					1	10.00 6.00	6.0
Kanhirapuzha irrigation							
Tractor / Dozer .					8	4.00	20.0
Motor grader					1	2.50	2.:
Scrapers					4	6.00	24.0
Dumpers					7	6.00	42.0
·					33	gade Antoniosophia (antoniosophia antoniosophia Alexandri Africano) il Africa de Alexandria (antoniosophia antoniosophia	120.0
				(and the second s	
MADHYA PRADESH							
Mahanadi Reservoir Scheme							
Excavator 2.5 Cu. yds.					4	10.00	40.0
Dumpers 35 T				•	18	10.00	180.0
Tractors 250 H.P		•		Si	28 9	6.00	54.
Scrapers 14—18 .				(6) N	18	5.00	90.0
Graders				281	3	2.00	6.0
Tractors 150. H.P				100	9	4.00	36.
Tractors 100 H.P	•	٠	, •	1/2	. 12	1.50	50.0
Other Projects				glid	7 677		
Excavators 21 Cu. yds.				General Control	14	10.00	140.0
Tractors 100 H.P				-	50	2.50	125.0
Do. 250 H.P.				स्र	गमन जुजन	6.00	72.0
Dumpers 35 T .					24	11.00	264.0
Scrapers 14—18 .					125	5.00	625.0
Graders 120					18	2.00	36.0
Compactors				•	19	0.50	9.5
Cranes		•			6	4.00	24.0
				******	341		1,769.5
MAHARASHTRA							
Dumpers 25T	•	•	•	•	80	6.00	480.0
Tractors 400 H.P		• .	•	•	6	9.00	54.0
Tractors 250 & 175 H.P.		٠	•	•	90	5.00	450.0
Shovels 3 cu. yds	•	•	•	•	6	10.00	60.0
Loaders 3.5 cu. yds	•	•	•	•	6	4.00	24.0
Scrapers 14—18 .	•	•	•	•	16	5.00	80.0
Rollers	•	•	٠	*	200	1.00	200.0
					404	<u> </u>	1,348.0

	1				2	3	4
9.	MYSORE						
	Hemavathy						
	Scrapers 14/20 cu. yds.				. 30	6.00	180.00
	Tractor 200 H.P.	•	•	•	. 3	5.00	15.00
	Pushers	•	•	•			24.00
		•	•	•	. 4	6.00	
	Tractors 100 H.P.	•	•	•	. 6	2.50	15.00
	P.W.D. Irrigation outh Thun	gbh	adra				
	Scrapers 14/20 Cu. yds.				. 30	6.00	180.00
	Tractors 300 H.P.				. 12	6.00	72.00
	Tractors 180 H.P.				. 48	3.00	144.00
	Tractors 100 H.P.				. 36	2.50	90.00
		•	•	•			
	Bochanki Project Hubli						
	Tractors (Cr.) 250 H.P.	•	•	•	. 2	6.00	12.00
	Tractors	•		•	. 2	2.50	5.00
	Trailers		•	•	A 128 2	3.00	6.00
	Const. of Irr. tank near Bal Kun	ıdi I	uluko	a Hun	dgund.		
	Scrapers					6.00	6.00
	Tractor					6.00	6.00
					177	ر در در این در در در در در در در در در در در در در	755.00
),	ORISSA						
	Talcher Thermal				Capacity Control		
	Tractor/Dozer .				सरामेव उगने	6.00	18.00
	Scrapers	_			3	6.00	18.00
	Cranes			•	. 2	6.00	12.00
	Clanes	•	•	•		0,00	
					8		48.00
۱.	PUNJAB						
	Mech. Drainage Div. Amritsa	ır.					
	Draglines				. 100	10.00	100.00
	Excavators 2.5 cu. yds.			• .	. 18	10.00	180.00
	· · · · · ·	•	•	•	. 30	6.00	180.00 60.00
	m u	•	•	•	. 10	6.00 3.00	6.00
	Batching & Mixing Plant	•		•	. 2	12.00	24.00
	Screening & Washing Plan		•		. 2	1.50	3.00
	Tractor 250 H.P.			·	33	6.00	198.00
	Tractor 120 H.P.			•	. 12	2.50	30.00
	Thein Dam						
	Excavators 7 cu. yds.			_	2	30.00	60.00
		-	•	•	. 8	15.00	120.00
	Do. 4.5	_					
	Do. 4.5 ,, ,, . Do. 2.5 ,, ,,.			•	, 5	10.00	50.00

	1			2	3	4
	Tractor (Cr.) 200-300 H.P.			25	6.00	150.00
	Tractor (Wh.)			4	4.00	16.00
	Scraper 30 cu. yds			2	10.00	20.00
	Dumpers (R) 20 cu. yds.			30	6.00	180.00
	Dumpers (Bottom) 20 cu. yds .			62	6.00	372.0
	Craders 125. H.P.			12	2.50	30.0
	Cranes			12	6.00	72.0
	Truck Tractors	•	•	6	3.00	18.0
	Trailers	•	•	13	3.00	39.0
	Mucking/MC 3/4 cu. yds.	•	•	5	2.00	10.0
	Rocker Shovel 2.5 cu. yds.	•	•			
	Batching & Mixing Plant	•	•	10	4.00	40.0
		•	•	3	12.00	36.0
	Transit Mixers	٠	•	20	4.00	80.0
				358		2,254.0
	RAJASTHAN					
	Rajasthan Canal Project					
	Tata P & H Dragline 3 cu. yds.		•	10	10.00	100.0
	Tractor (Cr.) 100—90 H.P.		•	10	2.50	25.0
	Tractor 50 H.P.		- FE	19	1.00	19.0
	Tractors (Cr.) 300-400 H.P.		- STATE	36	9.00	324.0
	Tractors (Cr.) 235 H.P.		(Z.50)	54	6.00	324.0
	Scrapers (T) 30 cu. yds.		100	36	2.00	72.0
	" 25 Do	•	tellar.	54	1.50	81.0
	Tractor (Cr.) 400 H.P.	•	ANARS.	9	9.00	81.0
	F.E. Loaders 2.5 cu. yds.	•	0.437	11.3/3/		16.0
	17.E. Loaders 2.5 cd. yds.	•	1/44	232	4.00	
			11 TO	232		1,042.0
3.	TAMILNADU		Vietness C	20.57		
	Ponnania Reservoir		manite	र जगाने		
	Tractor		선생님	4 2194	2.50	2.5
				1		2.5
.	UTTAR PRADESH					
	Maneri Bhali Stage II					
				2	10.00	20.0
	Excavators	•	•			
		•		1	6.00	6.0
	Excavators		•	1 2	6.00 3.00	
	Excavators		•			6.
	Excavators	•	•	2	3.00	6. 150.
	Excavators	•		2 25 1	3.00 6.00 6.00	6. 150. 6.
	Excavators			2 25 1 4	3.00 6.00 6.00 3.00	6.150.4 6.4 12.4
	Excavators			2 25 1 4 5	3.00 6.00 6.00 3.00 2.00	6.4 150.4 6.4 12.4 9.
	Excavators			2 25 1 4 5	3.00 6.00 6.00 3.00 2.00 0.80	6.0 150.0 6.0 12.0 9.0
	Excavators Tractors Loaders (Wh.) Dumpers (R) Crane Tr. Trailer Pneumatic Loaders Loco Batching & Mixing Plant	-		2 25 1 4 5 8 5	3.00 6.00 6.00 3.00 2.00 0.80	6.4 150.4 6.4 12.4 9.4 6.4 60.4
	Excavators Tractors Loaders (Wh.) Dumpers (R) Crane Tr. Trailer Pneumatic Loaders Loco Batching & Mixing Plant Transit Mixer			2 25 1 4 5 8 5 8	3.00 6.00 6.00 3.00 2.00 0.80 12.00 4.00	6.4 150.4 6.4 12.4 9.4 6 60.4
	Excavators Tractors Loaders (Wh.) Dumpers (R) Crane Tr. Trailer Pneumatic Loaders Loco Batching & Mixing Plant Transit Mixer Crushing & Aggregate Plant			2 25 1 4 5 8 5	3.00 6.00 6.00 3.00 2.00 0.80	6.0 150.0 6.0 12.0 9.0 6.0 60.0
	Excavators Tractors Loaders (Wh.) Dumpers (R) Crane Tr. Trailer Pneumatic Loaders Loco Batching & Mixing Plant Transit Mixer			2 25 1 4 5 8 5 8	3.00 6.00 6.00 3.00 2.00 0.80 12.00 4.00	6.4 150.4 6.4 12.4 9.4 6.6 60.4 32.
	Excavators Tractors Loaders (Wh.) Dumpers (R) Crane Tr. Trailer Pneumatic Loaders Loco Batching & Mixing Plant Transit Mixer Crushing & Aggregate Plant Obra Thermal Extension Mobile Crane 30 T			2 25 1 4 5 8 5 8 2	3.00 6.00 6.00 3.00 2.00 0.80 12.00 4.00 5.00	6.150.6 6.6 12.6 9.6 60.32.
	Excavators Tractors Loaders (Wh.) Dumpers (R) Crane Tr. Trailer Pneumatic Loaders Loco Batching & Mixing Plant Transit Mixer Crushing & Aggregate Plant Obra Thermal Extension Mobile Crane 30 T ,, 75 T			2 25 1 4 5 8 5 8 2	3.00 6.00 3.00 2.00 0.80 12.00 4.00 5.00	6.4 150.4 6.4 12.4 9.4 60.3 32.10.
	Excavators Tractors Loaders (Wh.) Dumpers (R) Crane Tr. Trailer Pneumatic Loaders Loco Batching & Mixing Plant Transit Mixer Crushing & Aggregate Plant Obra Thermal Extension Mobile Crane 30 T ,,, 75 T Pulling Tr. 100 T			2 25 1 4 5 8 5 8 2	3.00 6.00 3.00 2.00 0.80 12.00 4.00 5.00	6.0 150.6 6.0 12.0 9.0 60.0 32. 10.
	Excavators Tractors Loaders (Wh.) Dumpers (R) Crane Tr. Trailer Pneumatic Loaders Loco Batching & Mixing Plant Transit Mixer Crushing & Aggregate Plant Obra Thermal Extension Mobile Crane 30 T ,, 75 T			2 25 1 4 5 8 5 8 2	3.00 6.00 3.00 2.00 0.80 12.00 4.00 5.00	6.0 6.0 150.0 6.0 9.0 6.0 32.1 10.

1		2	3	4
Sarda Sahayak				
Scraper		9	6.00	54.0
Tractor 250 H.P , .		1	6.00	6.0
Do. 150 H.P		1	5.00	5.0
Do. 80 H.P		1	1.50	1.5
Do. 250 H.P		5	6.00	30.0
Motor Graders	, ,	3	3.00	9.0
Scrapers		1	6.00	6.0
Tehrt Project				
Exeavators				
Electric Shovel 4—6 cu. m.		11	25.00	275.0
Diesel Shovel 2 cu. m		19	10.00	190.0
Trailing Cable for Shovel.			10700	20.0
Tractors 400 H.P	•	58	9.00	522.0
Tractors 250 H.P.	•	14	6.00	84.0
Carriers 35 T Rrear.	• •			1,300.0
	• •	130	10.00 0.60	· · · · · · · · · · · · · · · · · · ·
Tippers	• •	46		27.6
Loaders 1.25 cu. m		5	3.00	15.00
Convey mucker		10	3.00	30.0
Compactors		A SEEL		
Vibratory Compactors	<i>B</i>	15	0.50	7.50
Pneumatic Compactor	(6)	6	5.00 6.00	15.00 36.00
water aprintier	6		0.00	50.00
Drilling & Grouting Equpt.	0	SAME SERVER		
Jumbo		TO THE STATE OF TH	4.00	4.00
Drifters		Y 23 4 4 4 4 4		7.0
Diamond Coredrill		10	0.50	5.0
Wagon drills		19	0.50	9.5
Drills	- 42	22	0.50	11.0
Concrete Vibraters & Grouting Equi	pt. (Misc.)			16.5
Aggregate Plant		सन्यमेव जयते		
Processing Plant		1	20.00	20.0
Sand Processing		1	2.00	2.00
Washing & Screening Scalping Plant		2 1	1.50 4.00	3.00 4.00
Clay Processing		ì	2.00	2.00
Concrete Plants				
Water Chilling & Aggregate cooling	plant .	2	10.00	20.0
Batching & Mixing 200 cum/Lr,		2	11.00	22.00
Weigh Batchers			0.50	3.0
Pump Cretes 40 cum/Lr	•	2	4.00	8.0
Cranes		4	12.00	48.0
Agitating Cars 4 cu. m.	•	20	2.00	40.00
Dump trucks		20 4	2.00 0.50	2.00
Cement handling		•	0.50	2.0
Handling Plant	•	2	2.50	5 A/
Cement Carriers 10T		2 4	2.50 1.00	5.00 4.00
Bucket Elevators 50T	: :	i i	0.50	0.50
Transport				
Cement Carrier 16T		17	1.50	25.50
Trailers 40T	•	1	$\frac{2.50}{1.00}$	2.50 1.00
Mobile Servicing Units Road .		20	0.60	12.00
Road Maintenance				
Motor graders 130 H.P		10	2.00	20.0 16.0
Water Sprinklers		20	0.80	

1						-	•				
Cranes & Trailers											
Crane gantry 100T		·				1				5.00	5.00
Crane moblie 75 T						1				15.00	15.00
50 T		•	•	•		1				8.00	8.00
25.9		•	•	•		2				5.00	10.00
15 T		•				1				2.50	2.50
5 'T		·				1				1.00	1.00
Trailer with Tractor 100 T						1				6.00	6.00
50 T		·				4	ļ			4.00	16.00
70 T						2				5.00	10.00
						595					3,364.00
. WEST BENGAL				-							
Kangsobati											
Tractor (Cr.). 250 H.	р.									6.00	6.00
Tractor 250 H.P.						6				6.00	36.00
						7			THE RESERVE OF THE PARTY OF THE		42.00
CENTRAL GOVERNME	NT (U)	NION	TERF	RITOE	RIES						
Badarpur Thermal Plant.											
Tractor/Dozer 250 H				- 20	Ja	3 2	-			6.00	2.00
Mobile Crane 15 T Tr. Trailor 10T		•	•	13			da.			5.00 3.50	5.00 3.50
Chandigarh Capital (P)		•	•	168			939			5.50	2.24
Tr. Trailor				68		2	2			3.50	7.00
Motor Grader		•		10		$\tilde{1}$	9			3.00	3.00
I.P. Station				ì		91779	7				
Tractor 250 H.P.		_			12A Y	2				6.00	12.00
Salal Project		•	•	d	443	Ed.	50				
Excavators 6 Cu. yds				40	17/6	4	37			25.00	100.00
Excavators 2.5 cu. yo	ds	•		Tele:		3	98			10.00	30.00
Loaders (Wh.) 4 cu.; Dumpers 25T	yds	•	•	- 73		2 5				4.00 6.00	8.00 342.00
Dumpers 251	•	•	•	1	FUH	75	1				522.50
Constant				-		2731					13,894.40
Grand Total	· •										13,034.40
	ABST	RAC	T (I.	& P. S	SECT	OR)		_			
Sta	te								Nos.		Value in Rs. lakhs.
Andhra Pradesh .					•				30		790.00
Bihar					•	•	•	•	72		337.60
Gujarat			•	•				•	230		575.00
Haryana				•	•	•		•	72		419.50
Himachal Pradesh .		•			•	•	•	•	96		504.00
Kerala				•		•		•	33		120.30
Madhya Pradesh .					•			•	341		1,769.50
Maharashtra				•	•		•	•	404		1,348.00
. Mysore				•					177		755.00
. Orissa				•	•	•		•	8		48.00
. Punjab			•	•	•		•	•	358		2,254.00
Rajasthan								•	232		1,042.00
Tamil Nadu		,		• .	•		٠	•	. 1		2.50
. Uttar Pradesh .									595		3,364.50
West Bengal					•			•	7		42.00
Central Govt./Union Territo	ories .								75		522.50
Grand Total									2731		13,894.40

2. GOVERNMENT UNDERTAKINGS / CORPORATIONS

	Equi	pinen	1 & C	apac	ity 							Nos.	Cost Unit	Value in Rs. lakhs
			ı									2		4
. N.M.D.C.														
Electric Shovel 12/15 C	u. yds.											8	60.00	480.00
Electric Shovel 4.6 C.1	М					•						24	25.00	60, 0 0
Tractor Dozers 250 H.	P											64	6.00	384.00
		•			•		-					65	12.00	780. 0 0
Dumpers 100/120 Ton-	•				•	•	•					6	28.00	168.00
Dumpers 35 Tons		•	•	•	•			•	•			28	10.00	280.00
Dumpers 20/25 Toss		•	•	•	•	•	•	•				6	6.00	36,00
Motor graders		•	•	•	•	•		•	•	-		5	3.00	15. 0 0
Blast hole drills 9"	•	•	•	•	•	•	•				•	24	16.00	384. 0 0
		•	•	•	•	•	•	•	•			×	9.00	72. 0 0
Diamond core Drills		•			•	•	•		•	•	•	10	2.50	25.00
Percussion Drill Crawl	er .	•	•	•	•	•			•		•	10	6.00	60.00
Wagon Drills .		•	•	•	•	-	•	•		•	•	7	2.50	17.50
2. N. C. D. C.								3				265		3301.50
Shovels 6 Cu. yds.					6.84)							31	35.00	535 00
Dragline .		•	•	•	633				•	•	•	21 3	25.00	525.00
Dumpers 30'35 Tons		•	•	•	T.	T.A	TY	•	•	•	•		15.00	45.00
Tractors Dozers 250 H		•	•	•	77	λVV	11.18	•	•	•	•	159	11.00	1749.00
Blast Hole Drills 9" 1		•	•	•	100	E4.1	3787	5	•	•	•	39 26	6.00	234.00
ingst Title Dillia	2 27111	•		·	ALT.	7/4E	Yes	2	•	•			16.00	416.00
					Victor .		255	1			_	248		2969.00
3. Neyveli Lignite					सन	प्रमेव	जयते							
Diesel Shovels 1.8 to	2.3 Cu. 1	M.										2	10.00	20.00
Elect. Shovels 1.8 to 2	2.3 Cu. N	Æ.										1	10.00	10.00
Tractors/Dozers 250 1	I.P											5	6.00	30.00
Spreader .					•							1	30.00	30.00
Motor Graders .												2	3.00	6.00
Diesel Dragline 1.8 to	2.3 Cu.	vds.								-		1	10.00	10.00
Bucket Wheel Excavat	ors 1000	L.				•						2	70.00	140.00
												14		246.00
. H.S.L. Rourkela														
Tractor/Dozers .												4	6.00	24.00
Dumpers .												6	6.00	36. 0 0
Crane Rail											-			
		•	•	•	•	•	•	•	•	•	•	1	8.00	8.00
Loaders .			•	•	•	•	•		-	•		2	4 . W	8.00
-4												13 		76.00
5. Land Shaping Schemes	(Madhy)	a Pra	desh)											

				1										2	3	4
6. H. S. L. Bli	ilai			-												
Shovels 4.0	Cu. M.							,						5	25.00	125.00
Drilling rig		mm (_				5	20.00	100.00
Tractor/Do														3	6.00	18.00
Dumpers 5														12	15.00	180.00
Loco Diese											•			8	3.00	24.00
														33		447.00
7. H.S.L. Bar.	sua Iron N	Mines	5													
Dumpers.	Hauioak :	35 T												17	10.00	170.00
Excavators														6	25.00	150.00
Excavators														2	10.00	20.00
Tractors/D														6	6.00	36.00
Churn Drill														4	16.00	64.00
														35		440.00
, Dungri Lini	e Store C	luarr	v (Or	rissa 1	Minin	e Cor	porati	an)								
Tipping tru								-	235		, .			32	1.00	32.00
Tractor/De		٠.		•	٠.		0	10	21	3.				1	6.00	6.00
Scraper mo			·				623	J.E	월본	13				1	5.00	5.00
Wagon Dri							AND S			62				1	1.25	1.25
Loader 2 C							68			19				1	4.00	4.0
2000. 2 0	y						8			7				36		48.2
). Hirakud Inc	lustrial W	larke	(Orio	era)			1	M	ES.							
		Oins	(0/1.	3347			65	17/6	No.	35					4 00	4.04
Crane Crav		•	•	•	•	•	Tich	1	9 /	50	•	•	•	1 1	4.00 5.00	4.00
B. G. Loco	1000 1	•	•	•	•	•	-			8	•	•	-	1	J.00	5.0
							- 54	त्यमे	न जय	त				2		9.00
). Assam Agra	Industri	es Co	rpn (.	Assan	1)											
Tractor 60	н. Р.	•	•	•		•	-	•	•	-	-	•	•	6	1.00	6.00
. Cement Fac	tory & Li	me S	tore (Quarr,	y, M e	ghala	va									
Shovels 1.5	Cu. yds													2	8.00	16.00
Dumpers 16												:		2	4.00	8.00
Tractor/Do														1	6.00	6.00
Loader 2 C														1	4.00	4.00
	-													6		34.00
	o 11	•	<i>.</i>		· 61											
2. Daltari Iroi	i Ores Mi	ines,	Oriss.	a Mill	ing C	orpn.										
B. H. Drill:					•		•	•			•	•	•	3	10.00	30.00
Shovel Elec		ı. nı.			-							•		1	25.00	25.0
Tractors 25			•	•	•	•		•				•	•	1	6.00	6.0
Dumper 25	Τ.	•	•				•	•	•	•	•	•	•	4	6.00	24.0
Grader	•	•	•	•	•	٠		٠	٠	•	•			1	2.50	2.5
														10		87.5
										GRAN				718		

ABSTRACT (GOVT, UNDERTAKINGS/CGRPNS)

	Project													Nos.	Value in Rs. lakhs
1.	N.M.D.C.	•	•										-,	265	3301.50
2.	N.C.D.C.	•		•								,		248	2969.00
3.	Neyveli Lignite					.•								14	246.00
4.	H.S.L. Rourkela													13	76.00
5.	Land Shaping Schemes (M	.P.).												50	125.00
6.	H.S.L. Bhilai :													33	447.00
7.	H. S. L. Barsua Mines													3 5	440.00
8.	Dungri Line Store .													36	48.25
9.	Hirakud Industrial Works	•												2	9.00
10.	Assam Agro Industries						•							6	6.00
11.	Cement factory & Lime St	ore Q	uarry,	Meg	ghalay	a.	-						-	6	34.00
12.	Orissa Mining Corpn.		•		•	•	•		•					10	87.50
								To	TAL	٠				718	7789.25

3. OTHER GOVERNMENT DEPARTMENTS

			Equ	ipmen	t and	Capa	city						Nos.	Cost Unit	Value in Rs. Lakl
				1		B	ALC:		9				2	3	4
1. Gujarat						1	MY	44.9							
Office of the Dy. Director 100 H.P.	٠	•	•	ire, 1	A.P. N	Varasa	i					•	7	2.50	17.50
S. E. Agricultural O Tractor 60 H.P.	ffice,	Rajko	ot ,			77	यमे	. 371					35	2.00	70.00
						44	ાન	1 414	1				42		87.50
2. Kerala					·										
Various works B & Drilling Plant .	C Wi		P.W	.D.									35	0.50	17.50
3. Maharashtra									-						
Road Development Malb	arhill														
Loaders						, .							2	3.00	6.00
Dumpers					•			•		•			12	3.00	36.00
Wagon Drills		•	•	•	•		•	•		•	٠	•	2	1.00	2.00
Weigh Batching Pla	nt	•	•	•	•	•	•	•	•	•	•	•	1	4.00	4.00
B & C Sholapur															
Tankers	•	•	•	٠	•	•	•	•	•	•	•	•	15		7.50
Crushers	•	•	•	•	•	•	•	•	•	•	•	•	6	0.50	3.00
Kolapa B & C Divis Water tankers	ion ,							•					4	0.50	2.00
B & C Amravati															
Tractors		.,				٠.							4	2.50	10.00
Crushers				٠,,					-				3	0.50	1.50

				1									2	3	4
	B & C Poona											<u> </u>			
	Crushers	•	•	•		•	٠	•	•				31	0.50	15.50
	Mech. Div. Nanded														
	Diamond Drilling M/C	•	•	•	•	•	•	•	•	•	•	•	3	2.50	7.50
													83		95.00
	Rajasthan														
	Rajasthan Const. & Tra	nsmissi	ion												
	Tractor Tr. 30 T .												1	3.00	3.0
	Crane 15 T	•	•	•	•	•	-	•	•			•	1	6.00	6.0
													2		9.0
	Tamil Nadu														
	Ore Handling Scheme														
	Bucket wheel Excavator	r 4000	т.										2	50.00	100.0
	Reclaimers			.•									1	20.00	20.0
	Shovels	•	•	•	•		5000	125				•	2	10.00	20.0
	Mobile Crane	•	•	•	٠	2	462	8/6	25		•	•	1	6 00	6.0
	Loco	•	•	٠	•	(S.)				•	•	•	8	0.80	6.4
	Sheep Farm					733			2						
	Tractor 150 H.P.					B			9.				1	2.50	2.5
						Ĭ	Ni	u					15		154.9
	***					d		AL.	20						
	WEST BENGAL					157			77	-					
	Salt Lake & Dev.					18th		24	1						
	Crane 4 T	•	•	•	•	- 5	CT I'L	2 3077	5	٠.			1	3.00	3.0
						C	FANE	Тот	AJ.	•	•	•	178		366.9
					4	PRI	VATI	E BO	DIES						
1. /	Mysore Construction Ltd	<i>l</i> .				,	• • • • • • • • • • • • • • • • • • • •								
	Trax-cavators 2 cu. yds	i	•	•	•	•		•		•		٠	3	3.00	9.0
2.	Damp Mining Corporat	ion													
	Tractor Shovel												1	3.00	3.0
	Tractor / Dozer .												2	5.00	10.0
	Loaders (Wh.) .										,.		2	3.00	6.0
	Dumpers 15 Tons .	•				•						•	10	4.00	40.0
	Dumpers 25 Tons .	•	•	•	•	•	•	•	•	•	•	•	17	6.00	102.0
													32		161.0
3.	Y. M. Salagocar														
	Crawler mounted drill	with co	ompres	ssor 3	ļ" .								1	10.00	10.0
	Excavators 2.5 cu. yds		-										1	10.00	10.0
	· · · · · · · · · · · · · · · · · · ·												1	3.00	3.0
	Front End Loader (Cr.	, .	•												
	Front End Loader (Cr. Wagon Drills		•	•							•		1	1.25	1.2

4.			1									2	3	4
	Emco Pyt. Ltd.													
	Loader Wheeled		•	•	٠	٠		•		•		6	3.00	18.00
5.	Gurado L. Potcalem													
	Loaders (Wheeled)										. ,	1 ~	3.00	3.00
6.	Sallithoores Pvt. Ltd.													
	Shovel											3	10.00	30.00
	F. End Loaders (Cr.)											2	3.00	6.00
	Loader (Wh.) .					•						3	3.00	9.00
	Tractor with Ripper											1	9.00	9.00
	Tractor D-9 class											1	9.00	9.00
	Dumpers .				•							9	6.00	54.00
	Scrapers											1	6.00	6.00
	Drill with compressor	41″										1	12.00	12.00
	Dumpers 15 Tons											9	4.00	36.00
	Water Tankers .											2	0.50	1.00
	Mobile crane .											1	4.00	4.00
			-	-	•	· ·	·					33		176.00
							0	. 15				79		391.25
							63	URAN	D TOTAL	<u> </u>	· · ·			371.43
	EQU	IPM	ENT	-wis	E RE	QUII	REME	ENTS	DURIN	G THE 57	H PLAN			
-	Eq	ulpr	nent/	Capa	city		B			I & P Sector	Govt. Under- takings	Other Govt. Deptts.	Private Bodies	Total
			1				at		4	2	3	4	5	6
1.	Excavators						6	7/6						
	130000000000000000000000000000000000000									7				
	12/15 Cir. vide						0	3000		17	Q			s
	12/15 Cu, yds.						4	PHÌ	र्याच्या र जगने	17 17	8			
	4.6 C. M.						1	त्यमे	न जयते	17	51	• •	• •	68
	4 6 C. M. , 4 C.M.						27	त्यमे	न जयते	17 8	51 9	••		68 17
	4.6 C, M. , 4 C.M 1.89 C.M						7.	त्यमे	न जयते	17 8 108	51 9 6	2	 4	68 17 120
	4.6 C. M. , 4 C.M. , 1.89 C.M. , 1.5 Cu. yds.	•					7.	त्यमे	न जयते	17 8 108 6	51 9 6 2	••		68 17 120 8
	4.6 C. M 4 C.M 1.89 C.M 1.5 Cu. yds. Dredgers .						7.	त्यमे	व जयने	17 8 108 6 8	51 9 6 2	 2	 4 	68 17 120 8
	4.6 C. M. , 4 C.M. , 1.89 C.M. , 1.5 Cu. yds.						2	त्यमे	व जयते	17 8 108 6	51 9 6 2	 2	 4 	68 17 120 8
	4.6 C. M 4 C.M 1.89 C.M 1.5 Cu. yds. Dredgers .						7.	व्यमे	व जयने	17 8 108 6 8	51 9 6 2	 2	 4 	68 17 126 8
	4.6 C. M 4 C.M 1.89 C.M 1.5 Cu. yds. Dredgers Bucket Wheel .						7.	ह्यमे	व जयने	17 8 108 6 8	51 9 6 2 2	 2	 4 	68 17 120 8 8
	4.6 C. M 4 C.M 1.89 C.M 1.5 Cu. yds. Dredgers Bucket Wheel . Tractors						7.	त्यमे	न जयते	17 8 108 6 8	51 9 6 2	2	 4 	68 17 120 8 8 4
	4.6 C. M., 4 C.M., 1.89 C.M., 1.5 Cu. yds. Dredgers . Bucket Wheel . Tractors 300/400 H.P. (Cr., 250 H.P. (Cr.)						. 7.	ह्यमे	न जयते	17 8 108 6 8 	51 9 6 2 2	2 2	4	68 17 120 8 8 4 131 494
	4.6 C. M., 4 C.M., 1.89 C.M., 1.5 Cu. yds. Dredgers . Bucket Wheel . Tractors 300/400 H.P. (Cr., 250 H.P. (Cr.)						. 70	ह्यमे	न जयते	17 8 108 6 8 129 368 83	51 9 6 2 2		 4 2 2	68 17 120 8 8 4 4 131 494 85
	4.6 C. M., 4 C.M., 1.89 C.M., 1.5 Cu. yds. Dredgers . Bucket Wheel . Tractors 300/400 H.P. (Cr., 250 H.P. (Cr.) 150 H.P. (Cr.)							ह्यमे	व जयते	17 8 108 6 8 129 368 83 368	51 9 6 2 2 124 50		 4 2 2 1	68 17 120 8 8 4 131 494 85
	4.6 C. M., 4 C.M., 1.89 C.M., 1.5 Cu. yds. Dredgers . Bucket Wheel . Tractors 300/400 H.P. (Cr., 250 H.P. (Cr.) 150 H.P. (Cr.) 60 H. P. (Cr.))					**	त्यमे	व जयते	17 8 108 6 8 129 368 83 368 23	51 9 6 2 2 124 50 6	2	2 2 1	68 17 120 8 8 4 4 131 494 85 429 64
2.	4.6 C. M., 4 C.M., 1.89 C.M., 1.5 Cu. yds. Dredgers . Bucket Wheel . Tractors 300/400 H.P. (Cr., 250 H.P. (Cr.) 150 H.P. (Cr.) 60 H. P. (Cr.) Wheeled .	· · · · · · · · · · · · · · · · · · ·					*	व्यमे	न जयने	17 8 108 6 8 129 368 83 368	51 9 6 2 2 124 50		 4 2 2 1	688 17 120 8 8 4 4 131 494 85 429 64
2.	4.6 C. M 4 C.M 1.89 C.M 1.5 Cu. yds. Dredgers Bucket Wheel . Tractors 300/400 H.P. (Cr.) 150 H.P. (Cr.) 100 H. P. (Cr.) 60 H. P. (Cr.) Wheeled . Dumpers	· · · · · · · · · · · · · · · · · · ·					- 2	त्यमे	न जयते	17 8 108 6 8 129 368 83 368 23	51 9 6 2 2 124 50 6	2	2 2 1	688 17 120 8 8 4 4 131 494 85 429 64
2.	4.6 C. M 4 C.M 1.89 C.M 1.5 Cu. yds. Dredgers Bucket Wheel . Tractors 300/400 H.P. (Cr.) 150 H.P. (Cr.) 100 H. P. (Cr.) 60 H. P. (Cr.) Wheeled . Dumpers 100/12 Tons)					- 2	त्यमे	न जयते	17 8 108 6 8 129 368 83 368 23	51 9 6 2 2 124 50 6	2	2 2 1	688 17 120 8 8 4 4 131 494 85 429 64
2.	4.6 C. M 4 C.M 1.89 C.M 1.5 Cu. yds. Dredgers Bucket Wheel . Tractors 300/400 H.P. (Cr.) 150 H.P. (Cr.) 100 H. P. (Cr.) 60 H. P. (Cr.) Wheeled . Dumpers 100/12 Tons 50 Tons)						व्यमे	न जयते	17 8 108 6 8 129 368 83 368 23 4	51 9 6 2 2 124 50 6 		2 2 1	68 17 120 8 8 4 4 131 494 85 429 64
2.	4.6 C. M 4 C.M 1.89 C.M 1.5 Cu. yds. Dredgers Bucket Wheel . Tractors 300/400 H.P. (Cr.) 150 H.P. (Cr.) 100 H. P. (Cr.) 60 H. P. (Cr.) Wheeled . Dumpers 100/12 Tons 50 Tons 35 Tons)						त्यमे	न जयते	17 8 108 6 8 129 368 83 368 23 4	51 9 6 2 2 124 50 6	2	2 2 1	68 17 120 8 8 4 4 494 85 429 64 2
2.	4.6 C. M 4 C.M 1.89 C.M 1.5 Cu. yds. Dredgers Bucket Wheel . Tractors 300/400 H.P. (Cr.) 150 H.P. (Cr.) 100 H. P. (Cr.) 60 H. P. (Cr.) Wheeled . Dumpers 100/12 Tons 50 Tons)						व्यमे	न जयते	17 8 108 6 8 129 368 83 368 23 4	51 9 6 2 2 124 50 6 		2 2 1 	68 17 120 8 8 4 4 494 85 429 64 2
2.	4.6 C. M 4 C.M 1.89 C.M 1.5 Cu. yds. Dredgers Bucket Wheel . Tractors 300/400 H.P. (Cr.) 150 H.P. (Cr.) 100 H. P. (Cr.) 60 H. P. (Cr.) Wheeled . Dumpers 100/12 Tons 50 Tons 35 Tons)						ह्यमे	न जयते	17 8 108 6 8 129 368 83 368 23 4	51 9 6 2 2 124 50 6 	2	2 2 1 	688 17 120 8 8 4 4 131 494 85 429 64 4 6 77 376 346
2.	4.6 C. M 4 C.M 1.89 C.M 1.5 Cu. yds. Dredgers Bucket Wheel . Tractors 300/400 H.P. (Cr.) 150 H.P. (Cr.) 100 H. P. (Cr.) 60 H. P. (Cr.) Wheeled . Dumpers 100/12 Tons 50 Tons 35 Tons 25 Tons)						RUP .	न जयते	17 8 108 6 8 129 368 83 368 23 4	51 9 6 2 2 124 50 6 6 77 204 16		 4 2 2 1 	688 17 120 8 8 4 4 131 494 85 429 64 4 6 77 376 346
2.	4.6 C. M 4 C.M 1.89 C.M 1.5 Cu. yds. Dredgers Bucket Wheel . Tractors 300/400 H.P. (Cr.) 150 H.P. (Cr.) 100 H. P. (Cr.) 60 H. P. (Cr.) Wheeled . Dumpers 100/12 Tons 50 Tons 35 Tons 25 Tons 15 Tons)						RUP .	न जयते	17 8 108 6 8 129 368 83 368 23 4	51 9 6 2 2 124 50 6 6 77 204 16		 4 2 2 1 	8 68 17 120 8 8 8 4 4 131 494 85 429 64 4 4 6 77 376 346 40

				1						2	3	4	5	6
5.	Front End Loaders,	Rock	Sho	vels &	k Mu	ckers	•	•		68	4	2	18	92
6.	Motor Graders									57	8			65
7.	Cranes (Crawler, Tru	uck me	ounte	d or	mobil	les)								
	75 Tons .								•	3	• •		• •	3
	50 Tons . 30 Tons .	•	•	•	•	•	•	•	•	1 7	••	• •	••	1 7
	15 Tons .	•		•	•	•		•		34	1	2	1	38
	5 Tons . Rail	٠	•	•	•	•		•	. •	1		1	• •	2 1
	Gantry	:	:	•	•	•		•	•	3	1			3
8.	Spreaders										1	••		1
9,	Tippers									56	32	19		107
	Water Sprinklers									34	• •	••	2	36
	Batching & Mixing I	lants				·				16			• •	16
	Weight Batchers						•	-	•	6		1	.,	7
	Crushing & Aggrega	ta Dec	ceca:	ne 131	anto	•	-	٠	-			40		43
	Pump cretes .	w FTO	CCSSI	បន្ត 👫	# iitS	•	•	•	1777	3 2	••		• •	2
	Tractor Trailers .	•	•	•	•	•	50		SIL.		• •		••	39
		•	•	•	•	(6 B			38	• •	1	• •	78
		· - Bl		•	•	•	1			78	• •		• •	4
	Screening & Washin	g Plan	ts	•	•	•	-18	A SE		4	• •		• •	
	Vibratory Rollers	•	•	•	•	•	-)	111	144	200	• •	• •	• •	200
	Compactors .	•	•	•	٠	•	馬	413	1777	37	••	• •	• •	37
23.	Scalping Plants.	•	•	•	٠	•	保	4	9317	1	••	• •	• •	1
	Clay processing Plan			•		•	7			1	• •		• •	1
22.	Water Chilling & Co	oling	Plan	its.	٠	•	÷	1414	व जयन	2	• •	• •	••	2
23,	Sand Processing Plan	nt	•	•		•			•	1	• •	• •	• •	1
24.	Cement handling PI	ants		•		•	•	•	•	2		• •	• •	2
25.	Cement Carriers			•	•	•			•	21		• •		21
25.	Bucket elevators		•	•			•	•	•	1				1
27.	Jumbo drill .	•	•	•	•		•	•	•	1	• •	• •	• •	1
28.	Diamond Core dril		•		•	•		•	•	10	10	3	• •	23
29.	Wagon drills					٠		•	•	41	8	37	3	89
30.	Locos & Shunters	•				•	•		•	9	9	8	• •	26
31.	Mobile Servicing Un	its		•	•	•			•	20			• •	20
32.	B. H. Drills 9".								•	• •	50	• •	7.4	50
33.	B. H. Drills 6"			•		•	•		•		11			11
34.	Percussion Drills	•				•			•	• •	10	••		10
35.	Drilling Rigs .								•	• •	5			5
36.	Churn Drills									•••	4	• •		4
37.	Reclaimer .											1	, ,	1
						TOTAL			-	2731	718	178	79	3706

No. 1(3)/62-Policy

Government of India

Ministry of Irrigation and Power

New Delhi, the 18th May, 1964

RESOLUTION

Under this Ministry's letter No. DW, III-28(6)/54 dated the 17th January, 1955 addressed to all State Governments a Standing Committee of Experts was constituted for the purpose of Standardization of important earthmoving and construction equipments and for recommending the Standardised makes of such equipment for use on River Valley Projects under execution or to be executed in further. All River Valley Projects costing more than Rs. 10 crores were represented on the Committee through their Chief Engineers. As the number of such projects had increased and the Committee became unwieldly, the need of revising the basic constitution of the Committee was felt. It was, therefore, decided thatthe Committee would consist of only one expert from each State and representatives of certain important national undertakings and the concerned Central Ministries.

2.	In pursuance of that decision, the Committee is now re-constituted as follows:—	
1.	Shri M. R. Chopra, Chairman, CW & PC	
2.	Shri A. R. Venkatraman, Member (P &P) CW & PC	
3.	Shri A. G. Narayanaswamy, Finance Officer, Ministry of Finance (Deptt. of Expenditure), New Delhi Do.	
4.	Shri B. C. Gangopadhyay, Deputy Secy., Min. of I & P., New Delhi Do.	
5.	Shri R. S. Bhalla, Dy. Materials & Plant Officer, Roads Wing, Min. of Transport, New Delhi . Do.	
6.	Shri N. T. Gopala Iyenger, Development Officer, Deptt. of Technical Development, New Delhi Do.	
7.	Brig. K. Sundaram, Director, Technical Planning Principal, Border Roads Organisation, New Delhi Do.	
8.	Shri J. S. Mathur, Dy. Director, Office of the D. G. S. & D., New Delhi Do.	
9.	Shri B. Parthasarathy, Chief Engineer, (Civil), D.V.C. Maithon, Bihar	
10.	Shri D. Mookerjea, Chief Engineer, Farakka Barrage Project, Farakka, West Bengal Do.	
11.	Shri K. C. Nayar, Mechanical Engineer, (Planning Division), National Mineral Development Corporation Ltd., New Delhi (1/6 Pusa Road) . Do.	
12.	Shri B. D. Sahi, Chief Enginerer, National Coal Development Corp. Ltd., Ranchi, Bihar . Do.	
13.	Shri J. S. J.tin, General Manager & Chief Engineer, National Projects Construction Corporation Ltd., New Delhi Do.	
14.	Shri R. Ramachandra Pillai, Dy. General Manager, Neyveii Lignite Corporation Ltd., P.O. Neyveli-1, Distt. South Arcot, Madras	
15.	Shri G. A. Narasimha Rao, Irrigation Adviser, Consulting Engineer & Additional Secretary to the Govt. of Andhra Pradesh, P.W.D. Hyderabad Do.	
16.	Shri K. I. Idiculla, Dy. Chief Engineer (General & Projects), Govt. of Kerala, Trivandraum . Do.	
17.	Shri B. L. Singh, Chief Engineer (Kosi), Patna	
18.	Shri S. D. Kadam, Superintending Engineer (Mechanical Organisation), Govt. of Gujarat, Ahmedabad	
19.	Shri R. S. Gill, General Manager, Beas Project, Talwara Township, Punjab Do.	
20,	Shri S. G. Hiremath, Superintending Engineer, Mechanical Circle, Govt. of Maharashtra, Poona Do.	
21.	Chief Engineer, in-charge of Parambikulam-Aliyar Project, Govt. of Madras, Madras	
22.	Shri S. P. Singh, Superintending Engineer (Equipment), Govt. of Uttar Pradesh, Irrigation (B) Department, Lucknow Do.	
23.	Shri R.A.A. Char, Superintending Engineer, Electrical and Mechanical, Govt. of Madhya Pradesh, Raipur.	
24.	Shri Syed Malchuddin Ahmed, Executive Engineer, P.W.D., Govt. of Mysore, Bangalore . Do.	
25.		
26.	Shri R. C. De, Divsional Engineer (Mechanical) Flood Control Deptt. Govt. of J & K, Srinagar . Do.	
27.	Shri A. K. Char, Chief Engineer, Ranapratapsagar Dam, Kota, Rajasthan Do.	
	Shri Ripudaman Singh, Chief Engineer, (Irrigation), Govt. of West Bengal, Calcutta Do.	
	Shri S. P. Chug. Director, (P&M) C.W.&P.C	y

Appendix 7.1

TRAINEES PASSED OUT FROM THE CENTRAL WATER AND POWER COMMISSION — TECHNICAL TRAINING CENTRES FROM THE YEAR 1956 TO 1971 (CENTRE-WISE)

			Cour	rse				Year of Passii	ng		Sponsored I	ру	Tota
										Irrigation and Power Projects	Foreign Countries	Others	
, ,				1				2		3	4	5	6
. Technic	ul Trai	ining (Centre	, Kəta	ıh,								
lst.								. 1956		26			2
2nd.					•			. 1957		35	* *		3
3rd.			-					. 1958		38			3
4th.								. 1959		39			3
5th.								. 1960		39			3
6th.								1961		39			3
7th.								. 1962		39		. ••	3
8th.				٠.				. 1963	120	52	1	••	5
9th.			٠.					. 1964		49		6	5
10th,				• .				. 1965		53		6	5
11th.								. 1967	199	41		.,	4
12th								. 1968		48	3	3	5
13th					•	•		. 19 69	47	2	* *	49	4
14th.	•			•				. 1970	777	26		43	6
15th.				•				1971		13	1	35	4
				٠.				सद्यमेव ज	TOTAL	539	5	142	68
. <i>Technica</i> 1st.	l Trair	ning C	Gentre,	Naga	rjunas	sagar	Danı	. 1957	_	42			
2nd.	•	•	•	•	•	•	•			33	* *		4
3rd.	٠	•	•	•	•	•	•	1050		40	• •	• •	3
3ru. 4th.	•	•	•	•	•	•	•	. 1959	4		• •	• •	4
4th. 5th.	•	•	•	•	•	•	•	. 1961		37 38	••	• •	3
	•	•	•	•	•	•	•				• •	• •	
6th. 7th.	•	•	•	•	•	•	•	. 1962 . 1963		40 35		••	4
7tii. 8th.	•	•	•	•	•	•	•	a state			2	• •	ۇ ر
	•	•	•	• •	•	•	•			50	2	8	6
9th.	•	•	•	•		•	•	. 1965 . 1966		51		• •	5
10th	•	•	•	•	•	•	٠			57 53	3	• •	6
11th.	•	•	•	•	•	•	•	. 1967		52	• •	4	5
12th.	•	•	•	•	•	•	•	. 1969		26	2	27	5
13th.		•	•	•	•	٠	٠	1970		4	• • •	44	4
14th.	•	•	•	•	٠	•	•	. 1971		19	• •	29	4
								75 	-	524	9		
								..	TOTAL	E74	n	112	64

				1					2	3	4	5	6
Technic	al Trai	ning (Centre	, Kak	rapar								
1st.						•			1965	54			5
2nd.									1966	56	• •,	.,	5
3rd							•		1967	48			4
4th.									1968	37			3
5th.		٠							1969	••		44	4
6th.	•						•		1970	6	• •	40	4
									TOTAL	201		84	28
				_									
Technic	al Trai	ning (Centr e	, Nan	gal.								
Technic	al Trai	ning (Centre •	, Nan	gal.	•	•	•	1964	56	••		5
	al Trai	ning (•	Centre •	, Nan	gal. ·		•		196 4 1965	56 59	••		
1st.	al Trai	ning (• •	Centre • •	, Nan	gal. • •								5
1st. 2nd.	al Trai	ning (Centre	, Nan	gal.	•	•	•	1965	59	••		5
1st. 2nd. 3rd.	•	ning (Centre	, Nan	gal.			•	1965 1966	59 45		 11	5 5
1st. 2nd. 3rd. 4th.		ning (, Nan	gal.		•	•	1965 1966 1967	59 45 55		 11 4	5 5 6
1st. 2nd. 3rd. 4th. 5th.		ning (, Nan	gal			•	1965 1966 1967 1 9 68	59 45 55 55	2	 11 4 4	5 5 5 6 5 5

YEAR-WISE ABSTRACT OF TRAINEES PASSED OUT FROM ALL THE FOUR CENTRES

	Yea	r of p	assing	g			(2)	(E) (E)	Sponsored by		Tota
							3	Irrigation and Power Projects	Foreign Countries	Others	
1956		•	•		•	•	•	26			26
1957			•		٠		•	77	• •		77
1958	•		•	•	•	•	•	71	• •	• •	71
1959	٠	•			•	•	•	79		• •	79
1960		•	. •		•		•	76	••	• •	76
1961	•	•		•	•	•		77	••	• •	77
1962		•	•			•	•	79	••		79
1963	•	•	•	•	•	•	•	87	3	••	90
1964							•	155	2	14	171
1965	•	•		•	•		•	217	••	6	223
1966	•	•	•	•	•	•		158	3	11	172
1967	•	•		•		•	•	196	• •	8	204
1968	•	•	•		•	•	•	140	5	7	152
1969	•	•	•	•	•	•	•	54	6	143	203
1970							•	50	3	163	216
1971 (up	to Sep	t., 197	71)			•		32	1	64	97
							TOTAL	1574	23	416	2013

SERVICE TRAINING PROGRAMME AS ORGANISED BY B.E.M.L.

The Service Training Cell in Service Department. Commercial Division, has been functioning with the prime objection of imparting training in operation, maintenance, servicing, periodical servicing and adjustments, assembly, dis-assembly and overhauling of various types of equipment which are in our current production programme, to BEML Service Personnel and as well as to the Staff of various customers order to ensure that BEML equipment supplied to customers should be maintained and work satisfactorily.

The Training programmes being organised for the BEML Service Personnel and the staff of the customers; facilities available at BEML factory; and particules of the syllabus and the instructions are detailed below:

TRAINING PROGRAMMES

A. Training for BEML Service Personnel

(1) Experience at the time of recruitment

The personnel recruited for BEML service set up are mainly Service Engineers and Service Technicians (Servicemen), having requisite qualification and sufficient past experience, in the field of Earth Moving equipment, maintenance, servicing repairs and operation.

The personnel having qualified in Degree/Diploma in Engineering and with a practical experience of 3/7 years in the earth moving equipment are only recruited for the post of Service Engineers and for the post of Service Technicians, the candidates having qualification in Diploma/Trade Certificate courses with practical experience of 1/4 years are being recruited. The matriculates/Non-matriculates are also being employed as Servicemen when they have sufficiently long experience in the practical field.

(2) Basic and Initial Training

The personnel so recruited, though having sufficient past experience on Earth moving equipment, are required to be trained on BEML equipment to bring them to such standard where they would be in position to attend to the problems on BEML equipment. Keeping this in view, the training courses are regularly being organised for newly recruited Service personnel for eight weeks on the shop floor of factory with demonstration of all types of equipments and major components in our Production line, to enable them to have thorough knowledge of BEML equipments to attend to the after-sales service when they are posted in the field.

(3) Advance and Specialised Training

Besides above basic and initial training courses, the following courses are also being regularly conducted for BEML Service Personnel to give them adequate and secialised knowledge of BEML equipment, and their sophisticated components; the latest developments on them; and their servicing and repairs.

(a) Training courses conducted by BEML Instructors

Referesher Training courses are being organised for BEML Senior Service personnel by BEML Training Instructors on particular type of equipment, whenever new type of equipment has been taken up in the manufacturing lines.

(b) Training courses organised by Sub-supplier of major components

Service Training courses on major assemblies—such as Cummins Engines, Converter-Inverters and Lucas TVS equipments are being organised at the factories of the suppliers of these components for all our BEML Service Personnel in order to give them full knowledge of these components fitted—on—BEML equipment for attending to the various problems arising on them—during—operation.

- (c) Training courses conducted by the experts of Foreign Collaborators
 - (i) Training programmes are also being organised at our KGF Works for BEML Service representatives and customers' Staff by inviting the training instructors from our collaborators for one week or a fortnight, depending upon the type of equipment and the number of equipments on which the training is to be imparted.

 Three such training courses have been conducted one by WABCO Instructors on Haulpaks Scrapers and Motor Graders for 3 weeks for BEML service personnel and Officers of customers; and two training courses by the Instructors of Radoje Dakie, Yugoslavia for BEML Service Staff; and the Officers and Technicians of Army and DGBR.
- (ii) BEML Service Personnel are bieng deputed to the factories of our collaborators viz. M/s. KOMATSU, JAPAN; M/s. WABCO, USA and M/s RADOJE DAKIC, YUGOSLAVIA, for advanced training courses in construction, functions, maintenance, servicing and repairs of the equipments and their sophisticated components which are concerned for manufacture under the collaboration agreement.
 - Some of the BEML representatives had already acquired training on Komatsu Crawler tractors for 2 to 4 months in Japan. Some service representatives are also being deputed to Yugoslavia for training on Tigar tractors for approximately six weeks.

B. Training Programmes for Customers' Staff.

(1) Training courses conducted at BEML Training Centre

Service Training Courses are being regularly organised for each type of BEML equipment separately for the Staff of our customers to whom such type of equipments are supplied, in proper operation, maintenance, servicing, preventive maintenance and dis-assembly & assembly of our equipment to enlighten them about all the procedures of the proper, maintenance and upkeep of the equipment.

Training courses on Dozers, Haulpak 35 trucks, Scrapers, Motor Graders and Tigar Tractors have been organised for the staff of NCDC, NMDC, ARMY, DGBR, Agro Industries Corporation, Irrigation Projects etc.

(2) Training Courses conducted at the site of customer

Service Training Courses are also being organised at the project site of the customers who have bought large number of BEML equipment in order to provide an opportunity to all servicing and operation Staff of customers to participate in the training course with practical demonstration of the machines.

Such training courses have been organised at Bailadila, NMDC, Bhurkunda NCDC, Barsua HSL and DGBR Projects sites for operators and mechanics on Haulpaks, Scrapers, Motor Gsaders, Dozers and Tigar tractors.

(3) Training of Engines; Sub-components and Lubricating oils

Service Training Courses on the major assemblies such as Cummins engine etc. and on lubricants are also being organised for the staff of the customers by inviting the Instructors from the suppliers of these items.

(4) Training to Operators

Training for Operators is mainly concentrated on practical operation of various types of BEML equipment, in Dozing, cutting, levelling, grading, loading, dumping etc. Besides practical operation training, the operators are explained and monstrated the daily and weekly checks; periodical servicing and adjustments and preventive maintenance to enable them to carry the maintenance and servicing in the field by themselves.

SYLLABUS AND INSTRUCTIONS

A. Syllabus

These Service Training Courses have been split into two categories;-

- 1. Basic Training Courses.
- II. Special and Advanced Training Courses.
- I. Basic Training Courses

The Basic Training Courses for BEML Service Personnel and as well as to the staff of customers are being organised regularly. The Basic Training course covers the instructions and practical demonstration on the following items:—

- (i) Construction and functions of various components of equipment.
- (ii) Servicing, repairs, maintenance and periodical adjustments of the machines and its components,
- (iii) Description of hydraulic systems, electrical systems, air systems etc., and their servicing and adjustments.
- (iv) Practical operation of the equipment.

The Basic Training Courses are being organised generally for one week duration for each type of equipment. This course would enable service personnel to commission the new machines and curryout the periodical servicing and adjustment of the mechines and to attend to the repairs, assembly dis-assembly etc. in the field.

This will also help the maintenance staff of the customers in carrying out preventive maintenance and adjustments.

- II. Special and Advanced Training Courses
- 1. These training courses are organised for some selected service personnel of BEML and senior staff of customers on particular type and model of equipment to make them more specialised in their particular type of machines, such as crawler tractors, scrapers, dumprs and motor graders and wheeled tractors.
- 2. These courses, would cover major repairs and major overhaul and testing of the engine, torque converter, transmissions (constant-mesh and power-shift), hydrair suspensions main clutches and differentials and final drives, valves, steering systems etc.
- 3. Repairs and re-building of under-carriage parts, calibration of fuel injection pumps, hydraulic valves and pumps, testing injectors etc.
 - 4. The duration of this course would be for 3 to 4 weeks.

B. Instructions

The instructions imparted and demonstrations conducted during the training course (Basic) are as follows: --

The theory classes are being conducted in the morning session and the practical demonstration is taken up in the afternoon session for first five days, for one type of equipment, depending upon the convenience.

On the sixth day, there is a general discussion of failures, trouble-shooting and their remedies and precautions to be taken. A test would be conducted on the same day in the afternoon session.

APPENDIX 7.3.1

EQUIPMENT & FACILITIES FOR TRAINING OF OPERATORS & MECHANICS ON SHOVELS & DUMPERS

Capital Cost of equipments Components (to be procured from completed Projects at Depreciated Cost)

Cupital Cost of Equ	apone a	13 Ct	, my jour	16/11 1	(10 00	proce	псц	. rom	יווייט	TETEL	110	ecis at 1sept	(Value in Rs. lal	chs)
Excavators								_	_			2 Nos.	@2.0	4.00
Dumpers					i							8 Nos.	@1.0	8.00
Tractor Dozer												l No.	@0.50	0.50
Grader									i	•		1 No.	@0.50	0.50
Excavator attachment (S	hovel.	Drag	line.	Clam	shell	Backi	ine (Crane)		į		1 Set	(3) = 1 -	1.00
Wheel Tractor Tanker				· · · · · ·	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		.00,	O	-			1 No.	@0.20	0.20
Trucks				•			•	•		•	·	2 Nos.	@0.20	0.40
Audio-visual	·		•		•	į	•	•	•	•		1 Set	@0.50	0.50
Stem-Jenny		•		•	•	•	•	•	•	•	·	1 No.	ഏ0.10	0.10
Fueling & Servicing equi	nment	•	•	•	•	•	•	•	•	•	•	1 Set	@0.20	0.20
Tools	ļ-1110111		•	•	·	•	•	•	·		·	1 Set	@0.10	0.10
Mobile Workshop	•	•	•	•	•	•	5000	450	•	•	•	i No.	@0.20	0.20
Transport vehicle	•	•	•	•	•	50	43	8/15	25	•	•	1 110.		0.30
·	•	•	•	•	1	(25B)		116	45	•	•			-
Assemblies						200			80					
Engine Assembly						689	.//		89			4 Nos.	@0.10	0.40
Transmission & Torque	Conve	rtors				- 100	94	99 P. C	γ.	٠		5 Nos.	@0.10	0.50
Hydraulic Pump Cylinde						- 1	Νij	UUU				2 Sets		0.05
Starting Engine & Comp	ressor					- 13	ш	207						0.05
Tourbo charger, super-cl	harger,	Blow	/cr	•		1951		Eliki Domini	38					0.10
Fuel Pumps						85%	1168	3317	43)					0.02
Clutch, Dry & Wet						A DECISION	3000	201	W.					0.05
Under Carriage						-		-						0.20
Final Drive & Plannetor	y Driv	'e				- 44	의사	키 기각:	1.				,	0.10
Brake System					•									0.02
Steering Assembly														0.01
Magnetorque Alternator	, Dyna	mo												0.05
Electric Motor & Contro	ols										•			0.05
Old Excavators and					•		•		•					2.00
Dumpers														1.50
Workshop Equipment														
Lathe	•			•)			
Drill											ļ			
Grinding					•		•	•	-		- }			
Milling			•					•			-			
Valve Grinding														2.00
Honing		•			•	•					- [
Boring	•										Ţ			
Fuel Pump Bench											-[
Crank-shaft grinding						•								
Engine Stand											1			
Racks											İ			
Dynamometer		•				,								
Work benches &	•					-		•		•	1			
Tools	•							•		•	j			

23.00

Appendix 7.3.2 EQUIPMENT & FACILITIES FOR TRAINING OF OPERATORS AND MECHANICS ON TRACTORS, SCRAPERS ETC.

Capital Cost of equipment & components (to be procured from completed Projects at Depreciated Cost)

C1														(Value	in Rs. lakhs)
	n T												. 10 Nos.	0.7	
	r Tractors	•	٠	٠	•		•	•	•	•	•		. 10 Nos.	0.7	
	Tractors	•	•	•	•	•		•		•				1.0	
-	s (Motorised)	•	•	•	. •			•		•	•		. 4 Nos.		
	s (Towed)	•	•	٠				•			•		. 2 Nos.	0.2	1
	Attachments-I	Dozer E	Blade	, Pu	shers	blac	le, E	xcavat	ors loa	iders, e	etc.				
Audio-v		•	•		•	-				•	•		. 1 Set	0.5	
Steam j										•			. 1 No.	0.10	
Fueling	& Servicing equ	ipment											. 1 Set	0.26	
Tools													. 1 Set	0.1	
Transpo	ort vehicle					,									0.3
Trucks		-													0.4
	,,														
4 ssembl													4 NIva	@0.1	0 0.4
Engines			•	•	•	•	•	•	• •	•	•		. 4 Nos.	(00.1	0.:
	ission & Torque			٠	•	•		•		•	٠		5 Nos		0.0
-	lic Pump & Cylin			٠				•	. ,	•	•	•	2 Sets		0.0
	Engine & Comp			•					-1700 27	•	•	•			
Fourbo-	charger, Super-c	harger,	Blo	wer				m	00	1		•			0.1
Fuel Pu	mps						8	RK		Ea.		•			0.0
Jnder C	Carriage						1		1		7				0.4
Final Di	rive, Plannetory	Drive .						1234		1900					0.3
Brake sy	ystem		,					OSE.		9250					0.0
	Assembly							. 1	YAT	146					0.0
								Y //	14 60	14.					0.0
	and C.C.Us.							بازيلي	M 10	17			•		0.1
	motors and cont	rols						A POPULATION OF THE POPULATION	ZOD.	and the					0.0
	ctors & Scrapers					Ċ	1	22.4	10	NEG					3.0
	op Equipment &		•	•	•	•		(L)	1	1					2.0
1011011	op zejarpinjem ce	. 0010		•	·	·	Ì	सुद्ध	मेव ज	यते					23.00
ſ₋ αĈΤ	uniunno do Bo deni	ined wa	v 1130		CO	ST ·	OF	TRAI	NING	OF C)PER	.ATC	DRS		
	rainees to be trai				<i>C</i> (0	ost ·	OF	TRAI	ning	OF C	OPER	.AT(DRS	120 operato 60 Mechanic	rs
	wnership & Oper	ating ex	креп.	ses	•			٠	•	OF C	OPER	.AT(DRS	120 operato	rs cs. s. lakhs)
	wnership & Opera Depreciation	ating ex on Cap	<i>xpen.</i> oital	ses Cos	· t witl	a life	at 10	0 years	•	OF C	OPER ·	.AT(ORS	120 operato 60 Mechanic	rs es. s. lakhs) 1.60
	wnership & Oper Depreciation Spare parts fo	ating ex on Cap or repai	xpen. pital rs	ses Cosi	witl	i life	at 10	0 years	•	OF C	OPER · ·		ORS	120 operato 60 Mechanic	os. s. lakhs) 1.60 3.40
	wnership & Oper. Depreciation Spare parts fo	ating ex on Cap or repai	xpen. pital rs	ses Cos P.C	witl	i life	at 10	0 years	•	OF C	OPER	.ATC	DRS	120 operato 60 Mechanic	rs cs. s. lakhs) 1.60 3.40 1.80
	wnership & Oper Depreciation Spare parts fo	ating ex on Cap or repai	xpen. pital rs	ses Cosi	witl	i life	at 10	0 years	•	OF	OPER		DRS	120 operato 60 Mechanic	rs cs. s. lakhs) 1.60 3.40 1.80 0.20
. 0	wnership & Open Depreciation Spare parts fo Operation on Misc.	ating ex on Cap or repai	xpen. pital rs	ses Cos P.C	witl	i life	at 10	0 years	•	OF (OPER		DRS	120 operato 60 Mechanic	rs cs. s. lakhs) 1.60 3.40 1.80 0.20
<i>O</i>	wnership & Open Depreciation Spare parts for Operation on Misc.	ating exon Capor repair expens	xpen. pital rs	ses Cos P.C	witl	i life	at 10	0 years	•	OF	OPER			120 operato 60 Mechanie (Value in Re	rs cs. s. lakhs) 1.60 3.40 1.80 0.20
. O	wnership & Open Depreciation Spare parts for Operation on Misc. blishment Jt. Director	ating eson Capor repair expens	xpen. pital rs	ses Cos P.C	witl	i life	at 10	0 years	•	OF	OPER		1 No.	120 operato 60 Mechanic (Value in Re	rs cs. s. lakhs) 1.60 3.40 1.80 0.20 7.00
. O	wnership & Open Depreciation Spare parts for Operation on Misc. blishment Jt. Director Asstt. Director	ating eson Capor repair expens	xpen. pital rs	ses Cos P.C	witl	i life	at 10	0 years	•	OF	·		1 No. 1 No.	120 operato 60 Mechanic (Value in Re	rs cs. s. lakhs) 1.66 3.46 1.80 7.00 1500 P.M. 800 P.M.
. O	wnership & Open Depreciation Spare parts for Operation on Misc. blishment Jt. Director Asstt. Director Supervisor	ating eson Capor repair expens	xpen. pital rs	ses Cos P.C	witl	i life	at 10	0 years	•	OF			1 No. 1 No. 1 No.	120 operato 60 Mechanic (Value in Re	rs cs. s. lakhs) 1.66 3.46 1.80 0.26 7.00 1500 P.M. 800 P.M. 500 P.M.
. O	wnership & Open Depreciation Spare parts for Operation on Misc. blishment Jt. Director Asstt. Director Supervisor Instructors	ating eson Capor repair expens	xpen. pital rs	ses Cos P.C	witl	i life	at 10	0 years	•	OF			1 No. 1 No. 1 No. 7 Nos.	120 operato 60 Mechanic (Value in Re	rs cs. s. lakhs) 1.66 3.44 1.80 0.20 7.00 1500 P.M. 800 P.M. 500 P.M.
. O	wnership & Open Depreciation Spare parts for Operation on Misc. blishment Jt. Director Asstt. Director Supervisor Instructors Foreman	ating exon Capor repair expens	xpen. pital rs	ses Cos P.C	witl	i life	at 10	0 years	•	OF			1 No. 1 No. 1 No. 7 Nos. 1 No.	120 operato 60 Mechanic (Value in Re	rs cs. s, lakhs) 1.66 3.44 1.86 0.26 7.00 1500 P.M. 800 P.M. 500 P.M. 500 P.M.
. 0	wnership & Open Depreciation Spare parts for Operation on Misc. blishment Jt. Director Asstt. Director Supervisor Instructors	ating exon Capor repair expens	xpen. pital rs	ses Cos P.C	witl	i life	at 10	0 years	•	OF			1 No. 1 No. 1 No. 7 Nos.	120 operato 60 Mechanic (Value in Re	rs cs. s. lakhs) 1.60 3.40 1.80 0.20 7.00 1500 P.M. 800 P.M. 500 P.M.

C. Building

Rent on buildings for School & Hostel or Dep. on building at 40 years life with cost of building at Rs. 20 lakhs

0.50

B+C=Rs, 1.80 lakhs.

Share of B+C-1.80 lakhs+180 Rs. 1,000 per trainee

Share of A-7.00 lakh \div 120

=Rs. 5,900 per trainee

Total

=Rs. 6,900

Stipend

Rs. 300

Total

Rs. 7,200 per trainec

If the Capital Cost is shared depreciation element on account of Capital cost of equipment and building will not be charged and the expenditure per trainee would be Rs. 5,600/-

If the stipend is also paid by the sponsoring. Dept, the expenditure per trainee would be Rs. 5,300/-

APPENDIX 7.4.2.

COST OF TRAINING OF MECHANICS

No. of Trainees to be trained per year—60 Mechanics

$A \cdot$	Ownership & Operat	ting ex	pens	es .									(Value in Rs. lakhs)
	Depreciation	with li	ife a	t 10 ye	ears								0.70
	Repair parts												0.50)
	P.O.L.												0.30
	Materials	•	-				-	F	33	-			0.60
	Misc.						(Feb.)	315	5/E	da.			0.30
							C.						2.40
В.	Establishment		(as per	Ope	rator	s) 👸			g			
C.	Buildings		(as per	Oper	ators	s)	NV	u				
Sha	re of A. 2.40 lakhs:	- 60			riii	Rs. 4	,000 pe	er trai	nee	Se .			
Sha	re of B+C as per ope	erators			=1	Rs. 1,	000 pe	r traii	nce	20			
		Tota	1		F	₹s. 5,	000 pe	r trair	nee	100			
		Stipe	nd]	Rs. 1,	200	त्यमे	া ব্য	ते			

If the Capital Cost is shared the exenditure per trainee would be Rs. 4,800.

Total

If the stipend is also paid by the sponsoring Department the expenditure per trainee would be Rs. 3,600.

Rs. 6,200 per trainee

APPENDIX 7.5

BENEFITS TO BE DRIVED FROM TRAINING

Considering the actual production figures of some major projects, the average yearly production value of a machine with 2 shifts working is about 30% of its value with an average utilisation of 50%.

This means equipment worth Rs. one crore being utilised only 50% gives a production of Rs. 30 lakhs.

In other words, Rs. 50 lakhs worth of machines, if utilised 100% can produce work worth Rs. 30 lakhs, or the productive value of equipment with 100% utilisation is 60% of its cost per year. However, in practice, the resultant pattern as may emerge may be indicated by quoting the example of Beas Project, where with the 80% utilisation, the value of production is of the order of 43% of cost of equipment.

If average utilisation of equipment can be improved by another 5% through training the personnel on repair, maintenance and supervision, the increase in production will be 3% of the value of equipment per year.

With the present population of equipment valued at above Rs. 300 crores, if the utilisation is increased by 5% of the present utilisation, the extra production that can be achieved will be Rs. 9 crores. The expenditure to be incurred on training the personnel will be about Rs. 40 lakhs pr year, which is only 5% of the extra production that can be achieved from the existing machines by increasing the utilisation by only 5% more.

11-4 CW&PC/ND/75

Considering the Irrigation Projects alone, where the equipment is worth Rs. 100 crores, the increase in production by 5% increase in utilisation will be Rs. 3 crores. The expenditure on training, if taken at Rs. 40 lakhs per year, is only 15% of the increased production.

It may, therefore, be expected that the expenditure that will be incurred on training will be received back many times by increase in production through better utilisation.

Production Value of Machines as obtaining at various Major Projects

Project					Value of equipment (Rs. in Crores)	Value of work done during one year (Rs. in Crores).	Average utilisa- tion
Ukai ,					8.0	3.88	40%
R.C.P.					3.0	0.73	50%
Beas Unit-II					10.0	4.3	80%
Ramganga					8.5	1.26	34%
Balimela .	-				6.21	1.16	30%
				•	35.71	11.33	50%

APPENDIX 8.1

TECHNICAL DEFECTS NOTICED IN ITEMS OF EQUIPMENT OF DIFFERENT MAKES AND OF DIFFERENT COUNTRIES OF ORIGIN

RUSSIAN EQIPMENT

(Comments received from Balimela, Farakka, Kharkhara Projects and N.M.D.C.)

1. Belaz 540 Dumpers

- (i) Hoist cylinder piston ring has broken after working about 900 hours.
- (ii) Hydraulic pump hoist cylinder leaks and rings break.
- (iii) Too much of oil consumption in the engine.
- (iv) Due to excessive carbon deposit in the engine the exhaust valves do not function.

2. Maz. 525 Dumpers

- (i) A single spring loaded clutch is very weak even for negotiating light gradients and failure is very common.
- (ii) Consumption of engine oil is very high.
- (iii) Starter is designed to work on 48 volts and requires four heavy duty batteries of 12 volts each.

3. Excavator Model E K G 4.6

- (i) Wear on under-carriage parts appears to be more in comparison to shovels of similar capacity of other makes. Almost all the road wheels (idlers) have broken.
- (ii) Wear on the racks of the dipper stick and the pinions is excessive,
- (iii) Holes of the End Casting which connects both the arms of the dipper slick to the bucket become large due to wear and the whole mechanism is to be opened frequently for re-building of the end casting.
- (iv) Excessive wear on the front wall of the bucket.
- (v) Propeller shafts which transmit power to the driving sprocket fail frequently.

4. Russian T--100-M--Tractors.

- (i) These machines are very light and are not suitable for heavy duty work.
- (ii) Under carriage portion is very light.
- (iii) The machines go out of order frequently.

5. Scraper D-357.

- (i) Injector tips wear out fast.
- (ii) Cracks develop on the sockets holding the injectors.
- (iii) Valve collects slip from the position causing damage to the valves, pistons and engine as a whole.
- (iv) Engine emits smoke even at low RPM.
- (v) Engine gets overheated very soon.
- (vi) Rocker—arm design is faulty causing breakage to the arm.
- (vii) Clutch facings wear out too soon.
- (viii) Frequent damage of hydraulic cylinders, bursting of hydraulic hoses and hydraulic steel pipes.
- (ix) Position of final drive housing not proper to permit tyre replacement by placing a jack below it. Also no guard plate is provided below crankcase to prevent damage to the crankcase.
- (x) Inadequate opening between apron and bowl, causing damage to apron in rocky outcrops.
- (xi) Inadequate stiffening of apron from the inside.
- (xii) No running edges provided on the side of bowl, causing quick wear on sides.
- (xiii) No stiffeners has been provided on the portion of bowls where cutting edge has been fitted.

EQUIPMENT FROM U.S.A.

(Comments received from Rajasthan Rajasthan Canal, Farakka, Ramganga, Gandak, Salandi Projects, J. & K. Flood Control Deptt., N.M.D.C., Neyveli Lignite and H.S.L. Rourke'a).

1. Eimco Tractor/Dozer,

- (i) Water pump seal & bearings give way too often.
- (ii) Construction design of the machine does not provide adequate space for attending to reapairs and adjustments conveniently.
- (iii) Ring gears are to be changed too frequently.
- (iv) Fan pulley shaft and belt require frequent replacement.
- (v) Quick wear of crank shaft, liners, rollers and bushings was noticed.

2. International Pay haulers.

(i) Breakage of differential tubes.

3. P&H Excavators.

- (i) Bucket latch keeper and latch bar gives frequent trouble.
- (ii) Breakage of horizontal and vertical propeller shafts.

4. TD-24 & TD-25 Tractors/Dozers.

- (i) Gear box font oil seal leakage is common.
- (ii) C.C.U. is defective.
- (iii) Track rollers and track idlers oil seals leak.
- (iv) Diesel ditution caused by leaky injectors.
- (v) Failure of cylinder heads and gaskets is common.
- (vi) Clutch failure resulting in damage to the pressure plate and cracks on the fly-wheel.

5. Mack Dumpers, L.R.V.S.W.

- (i) 4th. and 2nd gears break very often.
- (ii) Torque convertor oil seal leaks.
- (iii) Gear box front and rear oil seals leak.
- (iv) Insulator caps and bushes of rear suspension breaks or wear out frequently.
- (v) Head gaskets leak and water enters into the oil sump.
- (vi) Steering booster oil seals leak.
- (vii) Battery charging system is not efficient.

6. Cat. 630—B Dumpers.

- (i) The hitch pin and bushes get worn out frequently (after every 1000 hours).
- (ii) All the tyres fitted to these dumpers had developed side wall cracks making unfit for vulcanising.
- (iii) Dump cylinders develop cracks resulting in failure of '0' rings and leakage of oil.
- (iv) When the engines were opened up for overhaul after 5000 hours of operation, the pistons were found cracked on the top and radially through heat plugs.
- (v) The brake drums of drive wheels of the tractors develop heavy scoring and radial heat cracks and so require replacement after 6000 hours to 7000 hours of operation.
- (vi) Front suspension spring assembly is not able to carry the specified load resulting in breakage of the 2nd and main leaves.
- (vii) Cracks on the dump body and chassis.

7. T.C. --- 12 Tractors.

There are no equaliser bar or springs in these tractors with the result that the entire load of the machine comes on the final drive housing. As a result of this the bolts holding the housing to the chassis get sheared and at times damaging the final drives.

8. Mack M-18-X. Dumpers.

- (i) Breakage of stearing arms and wear on clutch facing while operating on soft ground conditions.
- (ii) Frequent replacement of hoist P.T.O. due to quick wear.
- (iii) Failure of reverse gear and its bearings in transmission assemblies.

9. Euclid 94-FD Dumpers.

- (i) Failure of clutch under soft ground conditions.
- (ii) Failure of outer hoist cylinder. In most of the Dumpers unloading is not achieved due to these defects on the hoist cylinders.
- (iii) Steering is hard.

10. TD -70 Euclid Rear Dumpers.

- (i) Connecting Rod bearing No. 2 & 5 of the engine are seizing very often resulting in breakage of connecting rod and bursting of engine blocks.
- (ii) Cracks are developing at the crown of connecting Rod Bearings resulting in breakage of bearing shell.

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11. Let. B--70 Scrapers.

- (i) Teeth of the ring gears fitted on scrapers break very often (after 100 to 500 hours of run run). In some cases the ring gear has broken into two or three pieces. Still in other cases the ring gears have cracked at the welded joints.
- (ii) The transmission oil gets mixed with final drive oil and vice versa due to the seals preventing mixing of oils are generally damaged.
- (iii) Clutch packs are damaged frequently and out put shafts also break into two pieces.
- (iv) Vanes on dynamic break impeller in torque convertor are breaking frequently. Torque conventor output shafts are also breaking into two pieces.
- (v) As there is no prescribed method for aligning engine and torque convertors the result is that the jack shaft which couple the torque vonvertor output shaft with final drive, wear out very fast.
- (vi) Generator voltage is poor and the contact points burn out very fast.
- (vii) V-71 G. M. engine fitted on the scrapers are over heating. It is due to the fact that there is no water jacket surrounding the cylinder liners below the air in-take parts.

EQUIPMENT FROM U.K.

(Comment received from Farakka Barrage Project)

1. Foden Dumpers

- (i) Clutch is very weak for the capacity of the mechine. Failure is very common.
- (ii) The gear type hoist pump provided fails between 500 to 1000 hours. Hoist trouble is very common.
- (iii) Clearance of differential from ground level is very low, thus the machine is likely to bog down frequently due to less ground clearance.

EQUIPMENT FROM CZEKOSLOVAKIA

(Comments received from Chambal and Salia Projects)

1. Tatra Dumpers.

- (i) Leaking of lubricating oil from the cylinder head.
- (ii) Excessive wear of clutch plate facings.
- (iii) Injector nozzles not working satisfactorily resulting in frequent re-calibration.
- (iv) Leakage of oil through tappet covers.
- (v) Leakage of hydraulic fluid due to cracks in hydraulic pipes.
- (vi) Frequent breakage of high and low speed gears.

EQUIPMENT FROM HUNGARY

(Comments received from Salandi Project, C.M.U., Kerala, Ex Engr. D.C.R. Divn. Madras & Peramabikulam Aliyar Project).

1. Mogurt Dumpers.

- (i) Failure of breaks.
- (ii) Rapid wearing out of clutch facings.
- (iii) Failure of gear shift forks.
- (iv) Leakage due to failure of rubber seals of water pump glands.
- (v) Frequent replacement of piston rings and liners are required Cracks in cylinder heads.
- (vi) Troubles with C.A.V. fuel injection pump.
- (vii) Frequent failure of metal couplings of fuel injection pump drive.

INDIGENOUS EQUIPMENT

(Comments received from Chief Engineer Balimela, N.M.D.C. Bailddila, Rourkela Steel Plant, Neyveli Lignite and Ramganga Projects).

1. D-120-6 &18 Tractors.

- (i) Before completing 500 hours of operation, the final drive hub of almost all the tractors were found to have been damaged. This is presumably due to the improper fitting of the sprocket nuts at the time of assembling the machines the defect is causing damages to the hub key and bearing of the final drive.
- (ii) Steering drum bolts of almost all the tractors were either found loose or missing even before the tractors had completed 240 hours of run. Excessive wear of steering brake drums and linings.
- (iii) Due to insufficient supply of oil from the clutch oil pump to the hydraulic intensifying mechanism, clutch in the tractors is found hard and the oil is getting heated up.
- (iv) Trackroller seals leaking after working for few hours only.
- (v) Rapid wear on under carriage parts.
- (vi) Diagonal braces of C frame break at welded joints.
- (vii) Engine Water Pump seals and bearings failure.
- (viii) Engine damaged due to valve falling into the cylinder after 16 hours operation.

2. D-80-8 Tractors.

- (i) First Gear slips on full load.
- (ii) Excessive wear and tear on the under carriage parts in all the tractors.
- (iii) Frequent break-down of self starter on almost all the tractors even after replacement.
- (iv) 'C' frame of almost all the tractors got cracked at various places.
- (v) Radiator started leaking.
- (vi) Hour meters in almost all the tractors become out of order.
- (vii) Engine main frame cracked near the engine mountings on both sides in some of the tractors.
- (viii) Draw bars in some of the tractors broke.
- (ix) Hydraulic jack seals start leaking.
- (x) Flywheel ring gears get damaged in most of the tractors.
- (xi) Excessive engine oil consumption.
- (xii) Propeller shaft universal joint gives frequent trouble.

3. Haulpak Model LW-35.

- (i) Running repairs of its engine and chassis are on the higher side.
- (ii) Engine cam shaft gears broke. Exhuast valves get damaged oil pressure in most of the machines is low. Wear on tyres has been found much more than that on similar types fitted on pay haulers. Premature failures of engines in many cases.
- (iii) Premature failure of transmission in some cases.
- (iv) Suspension mechanism seals require frequent replacement.
- (v) Failure of Turbo charger system within 1500 hours of service.
- (vi) Hydraulic oil is finding access into the main housing of the self-starter resulting damages to self-starter.
- (vii) There are no dust covers to prevent dust from getting into the dynamo as a result of which the dynamos cease working after some time. Starters in some cases also give trouble.
- (viii) The ampere meter starting switch and solenoid switches are giving constant trouble.

4. Haulpak Model C.F.A .- 15.

- (i) Front and rear suspension oil seals leaking.
- (ii) Brake troubles. There is no external arrangement for adjusting the clearance between the brake lining and drum,
- (iii) Trouble in the P.T. pump.
- (iv) Self starter trouble.
- (v) Hoist system not functioning properly.
- (vi) Wheel drums have cracked.
- (vii) Engine fuel system giving frequent trouble after only few hours of operation. Engine not taking load.
- (viii) Exhaust pipe opening is near the airintake filter causing exhaust gas drawn into the air-in-take.

5. Tata P & H--955-A.

- (i) Engine does not take load. RPM drops on load.
- (ii) Excessive heat on torque convertor after a few minutes operation on load.
- (iii) Engine trouble is very common.
- (iv) Propeller brakes do not function efficiently.
- (v) Intermediate swing clutch liners wear out quickly and require frequent replacement.

APPENDIX 8.2

MAXIMUM NUMBER OF HOURS OF OPERATION OF MACHINES, CORRESPONDING TO THE NUMBER OF YEARS THE MACHINES HAVE BEEN IN USE

सत्यमव जयत

Name of Pro	ject			Equipment	Year of purchase	Hours done from the date of initial Com- missioning
1				2	3	4
Lakheri Cement				. Compressor Bellis Morcan	1937	66000
Suvarnavathy Project .				. Tractor Cat. D-4	1946	15420
Chittargarh Irrigation Divisi	ao			. Tractor IH-TD-18	1946	6305
Lakheri Cement				Dumpers Muir Hill	1946	20000
Bhakra Nangal				Excavator LB-370	1948	22123
U.T. Chandigarh .		•		 Motorgrader Cat. 	1948	25000
Bhakra Nangal				. Dumper Euclid 27-FD	1949	21892
Tungabhadra				. Scrapers Cat. DW10	1950	2579
Bhakra Nangal				. Tractor Cat. D-7	1950	19420
Union Territory Chandigarh				. Crane-Kochring	1950	10000
U.T. Chandigarh	•	•	٠	. Motorgrader Cat. Motorgrader A.W.	1951 1951	25000 14000

1	2	3	4
Chandarpura Thermal Power Station .	. Dumper Euclid 70—FDT	1952	1883
	Dumper Rear	1952	814
	Tractor HD-15	1952	9943
Sirsi Dam Division	. Tractor Cat. D-8	1952	5918
T.I.S.Co.	. Crame Lima Mobile 15T	1952	43200
Hissar Bhakra Canal Circle	. Motorgrader Cat.	1953	7500
Sirsi Dam Division U.P	. Tractor IH-TD-24	1953	5171
Minor Irrigation Mysore	. Tractor Cat. D-6	1953	16280
Bhakra Nangal	. Motorgrader	1953	19176
	Crane Lorain 25T	1953	23289
Suvarnavaty Project	. Tractor Cat, D-7	1954	15084
, ,	Tractor Cat. D-6	1954	16337
Minor Irrigation Mysore	. Tractor Cat. D-6	1954	8541
Elect. & Mech. Division, Raipur	. Scraper AC—TS—200	1954	8254
T.I.S.Co.	Crane Neal Mobile 4T	1954	42000
	Crane Neal Mobile 4T	1954	38600
Rajkot Division	. Tractor Cat.	1955	19415
Upper Krishna Project	. Motorgrader Bristand	1955	355
Elect. & Mech. Division, Raipur	. Tractor Oliver Cletrac	1955	10335
Kandla Port Trust	. Crane Rapier 3T	1955	29440
T.I.S.Co	. Loader 1H Pay	1955	40000
Lakheri Cement	. Dumper Muir Hill	1955	30000
	Tractor Cat. D-8	1955	37000
Elect, & Mech. Division, Raipur	. Tractor TD-9	1956	1983
N.S. Right Canal	Scraper Cat. DW-15	1956	11798
N.C.D.C	Tractor TD-25	1956	6955
N.C.D.C	. Excavator Lima	1956	16438
	Dumpers Euclid B1TD	1956	5142
	Dumpers Euclid B3TD	1956	17824
H.S.L. Bhilai	. Tractor HD-21	1956	17369
	Tractor TD—24	1956	3489
	Scraper (M) AC—TS—360	1956	4337
	Motorgrader AC	1956	2539
Chambal Project Rajasthan	. Tractor TD—24	1956	15531
Hirapur (UP)	. Tractor TD—24	1956	10743
H.S.L. Bhilai	· Crane Lime 35 Tons	1956	16800
	Dozer Let.	1956	6843
	Dozer Let.	1956	1044
	Tractor D-120 Hathi	1956	4870
Fertilizer Corp. Nangal · · ·	· Tractor Cat. D—6	1956	24000
Lakheri Cement Rajasthan · · ·	 Shovel Marion 93M 	1956	33880
	Dumper Euclid B. 3—FD	1956	22975
Neyveli · · · · ·	· Crane Fowler TH. 35T.	1957	33674
N.C.D.C.	· Shovel RB—110	1957	34864
	Excavator P&H 955 2 · 5	1957	15715
	Excavator EKG8 Russian	1957	5817
H.S.L. Rourkela · · · · ·	· Dumper Let. 22 Tons.	1957	30000
Durgapur Steel · · · · ·	• Excavator 22 RB 0 · 75 Cyds.	1957	20000
	Scrapers Foden 4W	1957	26387
	Crane John Mobile 5T.	1957	17000
H.S.L. Bhilai.	· Tractor (Wheeled) IH—D—650.	1957	17971
	Tractor (Wheeled) LW-16.	1957	16524
T.I.S.Co.	· Crane Hyster 3 Tons.	1957	24000

1	2 .	3	4
Suvarnavaty Project	. Tractor Cat. D-8	1957	20514
Mechanical Drainage Division .	· Excavator LBK-110	1957	23829
Amritsar	. Tractor Cat. D-7	1957	11730
N.S. Left Canal Panset, Pawana, Ujjani	· Tractor IH—TD—24	1957	11055
Neyveli · · · ·	· Excavator RB-54 3·5 cyd.	1958	25000
,	Tractor Cat. D—8	1958	20408
H.S.L. (Rourkela)	· Dumpers Euclid	1958	36400
,	Crane IB-Rail 40T	1958	35000
L.S.L. Durgapur · · · ·	· Traxcavator 977	1958	1400
	Crane Coles Truck 27T	1958	2100
	Crane Mobile 22-RB. 10T	1958	1600
	Tractor Trailor 8 Tons.	1958	1660
H.S.L. Bhilai	· Excavator Tata PH 955—A	1958	336
	Excavator Russian C—100M	1958	348
	Dumper Mack B-81 SX	1958	69
	Crane Crawler Russian 25T	1958	282
N.P.C.C.	· Motorgrader Cat.	1958	116
Fertilizer Corpn. Nangal · ·	· Tractor Cat. D-7	1958	2200
r.I.S.Co.	Excavators Menck M—90	1958	3240
	Dumpers Euclid B3FD	1958	3600
	Crane Coles Mobile 12T	1958	3300
	Crane P&H, 655B (15T)	1958	3000
•	Pay Loader IH	1958	3000
esa Goa Pvt. Ltd.	· Loader Cat, 977	1958	1512
Lakheri Cement, Rajasthan · ·	 Dumpers Euclid B3—TD 	1958	2040
Chandrapura Thermal Station, West Ber	gal · Excavator P&H 955—A	1958	355
Upper Krishna Project · · ·	· Scraper C. Roadster	1958	70
	Dumper Rear	1958	411
Iddiki Hydel · · · · ·	· Tractor HD—16	1958	438
N.S. Left Canal · · ·	· Excavator N.W.	1958	1377
Panset Project · · · ·	· Tractor IH—TD—24	1958	461
Mech. Circle, Bihar · · ·	· Excavator Lima	1958	102 2
	Excavator RB	1958	
D.C.R. Division Tamilnadu · ·	· Tractor Cat. D-7	1958	65 79
N.S. Left Canal · · · ·	Excavator N.W.	1958	56
	Tractor HD—21	1958 1958	66
	Tractor Cat. D—8 Scraper	1958	14
Ramganga Project · · ·	• Excavator P&H	1958	78
Ukai Project · · · ·	· Excavator Demag	1958	128
Iddiki Hydel · · · ·	· Tractor HD—16	1958	73
Panset Project	Tractor IHTD24	1958	274
	Dumper Avlin-Barford	1958	247
Giri Hydel 🕠 🕠 🕟	· Muck Loader	1959	1847
Mech. Drinage Divn. Amritsar ·	· Excavator Koehring	1959	246:
Hissar Bhakra Canal Circle · ·	· Tractor TD—18	1959	769
Madras Harbour Development ·	Cranes P&H —655—B	1959 1959	3000 3000
R.R.O.	Cranes Lima Tractor Komatsu D—80	1959	474
K.K.O. ' ' ' '	Tractor Komatsu D80 Tractor Komatsu D120	1959	8
N.C.D.C.	· Excavator 110—R.B.	1959	404
	Excavator P&H	1959	209
	Excavator Marion	1959	316
	Tractor Cat. D—8	1959	1426
	Dumper Euclid 46—TD	1959	1561

1	2	3	4
H.S.L. Rourkela · · · ·	· · Tractor IH—TD—24	1959	30000
	Crane Coles (17T)	1959	20000
H.S.L. Durgapur · · · ·	· Crane Coles (25T)	1959	16450
H.S.L. Bhilai	· · · Crane P&H (50T)	1959	9694
Sesa Goa Pvt. Ltd.	· Loader Michigon (Wh.)	1959	13850
Lakheri Cement Rajasthan · ·	· Excavator Marion 93-M	1959	25850
	Dumper Euclid B—3—FD	1959	25990
r.I.S.Co.	- Loader Eimco	1959	33000
Bicholim Iron Ore, Goa · ·	· Excavator Marion 93-M	1959	22000
	Tractor HD—11	1959	22000
R.R.O.	- Tractor Komatsu	1960	1911
	Dumper Mack Truck	1960	28001
Madras Harbour Development .	· Excavator Unikop	1960	25000
N.C.D.C.	Excavator P&H —1600	1 960	27195
	Excavator Page Walking	1960	31957
I.S.L. Durgapur · · · ·	Crane RB-38	1960	15989
	Dumper Foden 6-W	1960	17244
allithoores. Goa. · · ·	· · · Dumper Euclid B—7—FD	1960	20000
V.N. Bandeker Goa	· Loader Michigon	1960	14520
Sesa Goa · - ·	· Excavator Lima 604	1960	15190
Mysore Cement Ltd	Dumper Rear Krup	1960	5000
	Tractor D—7	1960	10000
Eimeo Goa Pvt. Ltd	· Loader Eimco 123—	1960	2907
Hathmati Project Gujarat · ·	Tractor Cat. D—8	1960	10356
Rajasthan Canal	Tractor Cat. D—8	1960	12135
Chandrampally Project · ·	Excavator Skoda	1960	6316
N.S. Right Canal · · ·	· Excavator Ruston 5W. Walking	1960	5056
Perambikulam Aliyar Project Madr	rs · · · Tractors Cat. D—7	1960	12135
Rajasthan Canal · · · ·	· Tractors Cat. D—8 IH—TD—25	1960	16520
Ukai Project · · ·	· Excavators Marion	1960	11842
N.C.D.C.	 Excavators P&H (Elect.) 	1960	27195
Beas Unit—II · · · ·	· Tractor Cat. D—8	1961	16751
Perambikulam Aliyar Project Madr	as · · Excavators Unicop 150—HP	1961	5985
	Scrapers Cat. DW-20	1961	15670
	Tractors Cat. D-7	1961	1714
Ukai Project · · ·	· · · Tractors Cat. D—8	1961	19046
Rajasthan Canal · · ·	· Excavators P&H Dragline	1961	14973
R.R.O.	· Tractors Komastu D- 120	1961	8989
T.I.S.Co. · · ·	· Excavators Eimco-105	1961	24000
J&K Flood Control · ·	· Excavators 54—RB	1961	15536
	Dumpers Euclid	1961	8608
	Tractors Cat. D—8	1961	9331
Neyveli Lignite · · ·	· · Cranes IH-660D	1961	43216
H.S.L. Rourkela · · ·	· · · Dumpers Euclid D—141	1961	28000
Rajasthan Canal · · ·	· · · Scrapers Euclid	1961-62	6005
Kangsabati Project · ·	· · · Tractors Cat. D—8	1962	6340
	Scrapers Tournapull 'C'	1962	467
Beas Unit-II · · ·	· Excavator IEON & Rusting	1962	30411
	Dumper Euclid B-5FD	1962	21489
R.R.O.	· · · Tractors Komatsu D—120	1962	480
Haryana Dainage and Flood Cont	rol · · Excavators Skoda	1962	1400
H.S.L. Durgapur · · ·	· · · Tractors D—8	1962	14000
Neyveli Lignite · · ·	· Excavators 14—RB	1963	8505

¹²⁻⁴ CW & PC/ND/75

1							2	3	4
Beas Unit—I	•	•	•	•			Tractor Cat. D—8	1963	1408
Beas Unit-II	٠	•	•	•	•		Excavator B.E. (Elect.)	1963	1841
							Tractor Cat. D9	1963	1778
							Dumper Euclid B—2—TD	1963	21839
							Dumper Euclid 31—TD	1963	358
N.P.C.C.	•	•			•		Excavators Hind Marion 93M	1963	9620
N.C.D.C.	•	•	•				Tractors Cat. D—8	1963	17531
							Tractors Cat. D—8	1963	7000
Irrigation Deptt.	. Pui	njab					Excavator 38—RB	1963	16660
H.S.L. Rourkela	1	•		•			Crane Lima	1963	20800
H.S.L. Durgapu	r ·	•	•	•	•		Loader Hough	1963	17500
				*			Dumper Euclid B 2 TD	1964	14446
Beas UnitII							Excavator 150 -B (Elect.)	1964	23318
H.S.L. Durgapu	-			•			Tractor Cat. D-8	1964	13000
H.S.L. Rourkela	•	•	•	•			Tractor TD—25	1964	18200
Balimela Project	•	•	•	•		•	Tractor Russian C—100	1964	9128
							Excavator Russian (Elect.)	1964	8769
Ramganga Projec	et		•		•		Tractor Euclid C—6	1964	9179
Dandakaranya P	rojec	et ·	•				Tractor HD—21	1965	9748
Mula Project	•		•	•			Excavator Hind Marion	1965	7748
							Scraper Tournapull	1965	8883
Rajasthan Canal		•	-			-	Tractor TD-25	1965	4740
Ramganga Projec	it.	•	-	•	•		Scraper Letournea	1965	4000
Ukai Project		•	•				Dumper Cat. 619—C	1965	8763
N.P.C.C.	•	•			•		Dumper IH-Pay Hauler	1965	6436
N.C.D.C.	•	•	•	•	•	•	Dumper Mack M-30X	1965	12021
Ramganga Projec	t	•	•	•	•	٠	Dumper Euclid (Bottom)	1966	7896
							Excavator Marion	1966	10165
Ukai Project		• •	•				Scraper Cat. DW15	1966	12225
Neyveli Lignite					•		Tractor Cat. D—8	1966	15595
Beas Unit—II	•	•	•	•	•	٠	Tractor Cat. D-8	1967	5159
Mula Project	•	•		•	•	•	Tractor Cat. D—8	1967	5390
Giri Hydel	•	•	٠	•	•	٠	Excavator RB—22	1967	4600
Balimela Project	•	•	٠	•	•	٠	Dumper Cat. DW-20	1967	3382
Neyveli Lignito	•	•	•	•	•	•	Excavator P&H—955—A	1967	4970
Γ.I.S.Co,	•	٠	•	•	•	•	Dumper Mack M—15X	1967	10000
							Crane Tata P&H 655—B	1967	9000

LIFE OF EQUIPMENT AS ADOPTED BY VARIOUS USERS IN HOURS AND YEARS

20.	Name of User					Ē	Excavators				Tractors	ors	•
ċ					Electric		Diesel	Diesel		Walking	Above	Upto	Wheeled
			1	7 Cyds	4-6 Cyds.	3 Cyds	7 Cyds 3.	2.5 to 1. 3.5 Cyds.	1.75 Cyds.	J aguing	. 1.11		
	Beas Project			40,000	36,000	33,000	:	25,000	17,000	•	18,000	15,000	18,000
6	Ramganga Project	•		:	;	:	24,000	:	:	:	10,000	10.000	10,000
er,	Ukai Project .	•		:	:	:	:	:	:	:	12,000	12,000	:
4,	Neyveli	•	•	Bucket	Wheel	40,000 (20 yrs)	:	10,000 (7 yrs)	:	:	10,000 (7 yrs)	10,000 (7 yrs)	10,000 (7 yrs)
ห่	5. N.C.D.C. · · ·	•	•	36,000 (15 yrs)	30,000 (12 yrs)	स्यम् स्यम्		16,000 (8 yrs)	:	60,000 to (24 yrs) 1,20,000 (40 yrs)	12,000 (6 yrs)	. 16,000 (8 yrs)	:
9	N.M.D.C.	•	•	:	25,000	व ज	V.		:	:	:	10,000	:
*	Min. of Transport	•	•	:	:	रहे । पते			:	:	:	12,000	12,000
∞.	Parambikulam Aliyar	•	•	:	:		:	3	:	:	12,000	12,000	:
6	J & K Flood Control .	٠	•	:	:	:	:	15,000	12,000	•	:	10,000	÷
10.	10. Balimela Project	•	•	:	40,000	:	:	18,000	:	:	:	10,000	;
11.	Rajasthan Canal	•	•	:	;	:	:	22,000	:	:	:	15,000	:
12.	12. Yamuna Project . •	•		:	:	:	:	15,000	12,000	:	;	(7 yrs) 10,000	16,000
13.	13. Krishna Irign.	•	•	:	:	:	:	:	:	:	:	10,000 (5 yrs)	:
14.	14. Farakka Project	•		;	:	:	:	15,000	12,000	:	:	10,000	:
15.	Hindustan Steel .	•	•	:	20,000	18,000 (7 yrs)	:	18,000 (7 yrs)	18,000 (7 yrs)	:	:	10,000 (7 yrs)	10,000 (7 yrs)

*Figures taken from the Report of Road Building Machinery of Transport Department.

1	Name of User	Ser					Dumpers	ers	Loaders	Graders	Scrapers	ers		Cranes		Compressors	essors
						1	Above 35 Tons	Upto 35 Tons		I	Motorised	Towed	Crawler	Truck mounted	Mobile	Stationery Diesel Elect. Portabl	Diesel Portable
-	Beas Project						20,000	20,000	20,000	15,000		•	:	40,000	20,000	40,000	10,000
6	Ramganga Project	•	•	٠	•	•	10,000	10,000	10,000	10,000	10,000	:	20,000	12,000	10,000	10,000	8,000
က်	Ukai Project		٠,	,	•	•	15,000	12,000	:	:	12,000	:	:	:	:	:	:
4.	Neyveli	•	•	•	•	•	:	10,000	:	10,000	. :	:	:	:	:	:	:
જ	5. N.C.D.C	٠		•	•	•	16,000		:	:	:	:	20,000	20,000	20,000	10,000	10,000
							(8 yrs)	(6 yrs)					(10 yrs)	(10 yrs)	(10 yrs)	(8 yrs)	
9.	N.M.D.C.	•		•	•		:	10,000	:	9		:	10,000	ţ	:	10,000	;
*7.	Min. of Transport					•	:	12,000		15,000	SH	15,000	:	:	:	:	10,000
<u>%</u>	Parambikulam Aliyar	£.		•			:	गमव			15,000	:	:	:	;	:	:
ō,	J & K Flood Control	7	•	•	•		:	10,000	10,000	10,000	10,000	10,000	10,000	:	:	:	;
10.	Balimela Project .	•		•			:	11,000	À	10,000	5	:	:	;	:	:	:
11.	Rajasthan Canal		•			•	:	:	10,000 (10 yrs)	:	:	:	:	:	:	:	:
12.	Yamuna Project .		`•				:	10,000	:	; :	:	:	:	:	:	:	:
13.	Krishna Irign.						:	:	:	:	·:	:	:	:	:	:	:
14.	Farakka Project			•			:	10,000	:	10,000	10,000	:	20,000	:	10,000	;	•
15.	Hindustan Steel .						:	10,000	10,000	10,000	10,000	:	10,000		10,000	10,000	10,000
								(7 yrs)	(7 yrs)	(7 yrs)	(7 yrs)	_	(27 yrs)	(27 yrs)	(27 yrs)	(10 yrs)	(10 yrs)

*Figures taken from the Report of Road Building Machinery of Transport Department.

S. Z	Name of User			Locos			Belt Conveyors	veyors		Workshop	Pile Priving	Drilling	Drilling equipment	
ž	ó			Elect.	Diesel		Structure	Belt	Crushers	edanburen		Diesel 6¾″	Diesel 9"	Elect. 10½
_:	Beas Project			40,000	10,000		:			:		000'09	:	:
2.	Ramganga Project	•	•	:	:		:	:	:	:	:	:	:	:
æ.	3. Ukai Project	•	٠	:	:		:	:	:	:	•	:	:	:
4.	4. Neyveli			10 yrs	:		:	:	;	:	:	:	:	:
λ.	5. N.C.D.C	•	•	20 yrs	:	ñ	20 yrs	3 yrs	20 yrs	20 yrs	:	12,000 (6 yrs)	16,000 (8 yrs)	20,000 (10 yrs)
9	6. N.M.D.C.	•	•	:	:		:	:	:	:	:	10,000	;	:
*7.	Min. of Transport	•		:	•	2.		Sec. Sec.	6 yrs	:	12 yrs	12,000	:	:
∞	Parambikulam Aliyar	•	•	:	;	त्यमे			100	:	:	:	:	:
6	J&K Flood Control .	•	•	:	:	व जय	W.			:	:	:	:	:
10.	Balimela Project .	٠	•	:	:	ते ति		9:	2	:	:	:	:	:
11.	Rajasthan Canal .	•		:	:		:	:	:	:	:	;	:	:
12.	Yamuna Project .	•		:	:		:	:	:	:	:	:	:	:
13.	13. Krishna Irign	٠	•	:	:		:	:	:	:	:	:	:	:
4.	Farakka Project .	•		:	:		:	:	:	• • • • • • • • • • • • • • • • • • •	7 years for Hammer 10,000 hours for Frame & Vibro Sinker	:	:	:
15.	Hindustan Steel	•		:	:		:	:	:	:	:	12,000	12,000	:

*Figures taken from the Report of Road Building Machinery of Transport Department.

APPENDIX 8.4

STATEMENT SHOWING THE LIFE OF EQUIPMENT, DEPRECIATION PERCENTAGE AND THE REPAIR PROVISION

St. No.	Category of Equipment	1	Life in Years/ Life in hours	S.	ĞĞ	Depreciation % (Declining balance)	.c)	Residual life %	İ	Repair prov	Repair provision during life-time as % of cost	ng life-time	as
		Single Shift	Double Shift	Three Shift	Single Shift	Double Shift	Three Shift		<u>S</u> S	Single Shift	Double Shift	Three Shift	
-	2	3	4	5	9	7	æ		6	10	Ξ	12	
1 EXC	EXCAVATORS												
(A)	(A) Shovels, Draglines etc.			٠									
	(i) Elec. 4 cu, yds, and above	30,000	18 40,000	15 0 40,000	,	10 12.5		15	10	70	100		901
	(ii) Elec. 2.5 cu. yds. and 4 cu. yds.	18 22,000	30,000	12 30,000	12.5		15 17	17.5	01	20	75		80
_	(iii) Diesel 4 cu. yds. and above	18 22,000	30.000	12 30.000	12.5		15 17	17.5	01	20	75		08
	(iv) Diesel 2.5 cu. yds. to 4 cu. yds.	12	10 20.000	8 00 20,000	7	2 2	20	25	10	20	75		08
	(v) Diesel upto 2.5 cu. yds.	10.12.000	8 16,000	000'91 0		20 5	25	30	10	50	80		06
(8)	(B) Walking Draglines	30,000	18	3 15		10 12.5	V)	15	01	70	100		100
(C)	(C) Bucket Wheel Excavator	30.000	18	15		10 12.5	w _i	15	10	0/	100		100
<u>(a)</u>	(D) Dredgers. (i) Hull	30,000	18	15		10 12.5		15	10	40	\$		70
	(ii) Machine	12	10 20.000	8 0 20,000		16 20		25	10	40	99		0/

(ii) Between 15-T and 50-T	2	3	4	5	9	7	œ	6	10	=	12
(ii) Between 20-T and 50-T (1 2000 12,000 20 25 30 40 10 50 85 11 (iii) Above 50-T (1 2000 15,000 10,000 10,000 20 25 30 10 50 85 11 (iii) Between 15-T and 50-T (1 2000 10,000 10,000 20 25 30 10 50 85 11 (iii) Above 50-T (1 2000 15,000 10,000 10,000 25 30 10 70 120 120 11 (iii) Above 50-T (1 2000 15,000 10,000 10,000 10,000 25 30 10 70 120 120 11 (iii) Above 50-T (1 2000 15,000 16,000 16,000 16,000 20 25 30 10 70 120 120 120 14 (iii) Above 10 cu. yds. 12,000 15,000 16,000 16,000 20 25 30 10 10 80 130 130 (iii) Above 10 cu. yds. 12,000 16,000 16,000 16,000 20 25 30 10 10 80 130 130 (iii) Above 10 cu. yds. 12,000 16,000 16,000 20 25 30 10 10 80 130 130 (iii) Above 10 cu. yds. 12,000 16,000 16,000 20 25 30 10 10 80 130 130 (iii) Above 10 cu. yds. 12,000 16,000 16,000 20 25 30 10 10 80 130 130 150 10 10 8 65 150 10 10 80 150 10 10 80 150 150 150 150 150 150 150 150 150 15											
(ii) Between 30-T and 50-T (1000) 12,000 12,000 25 30 40 10 50 85 11 (iii) Between 30-T and 50-T (1200) 12,000 12,000 12,000 20 25 30 10 50 85 11 (iii) Above 50-T (1200) 16,000 10,000 20,000 16,000 10,000 20 20 25 10 70 85 11 (iii) Above 50-T (1200) 16,000 10,000 20 20 20 20 10 70 120 120 11 (iii) Above 50-T (1200) 16,000 16,000 16,000 20 25 30 10 70 120 120 11 (iii) Above 50-T (1200) 12,000 16,000 16,000 20 25 30 10 70 120 120 120 11 (iii) Above 50-T (1200) 12,000 10,000 20 25 30 10 70 120 120 120 120 120 120 120 120 120 12	(A) Bottom Dumpers	•									
(ii) Between 20-T and 50-T . 10,000 12,000 12,000 20,000 20 25 30 40 10 50 85 11 (iii) Above 5h-T . 12,000 16,000 20,000 16,000 20,000 16,000 20,000 10,000 10,000 10,000 10,000 10,000 20,000 20,000 10,000 10,000 10,000 10,000 10,000 10,000 10,000 10,000 10,000 10,000 10,000 20 25 30 10 10 80 130 130 10,000 10,000 10,000 10,000 20 25 30 10 10 80 130 130 10,000 10,000 10,000 10,000 10,000 20 25 30 10 10 10 120 200 10,000 10,000 10,000 10,000 10,000 10,000 10,000 20 25 30 10 10 40 65		œ	9	S	ţ		:	:			
(ii) Retween 20-T and 50-T . 100	(i) Below 201	10.000	12,000	12,000	25	30	9	10	20	\$2	92
(ii) Above 50-T	T Of the T Of manufact (ii)	10	œ	9	ć	ć	ç		ç		,
(iii) Above 50-T	(ii) Detween 20-1 and 30-1	12,000	16,000	16,000	70	3	30	10	90	82	3
(ii) Below 15-T	T 03 ***********************************	12	01	∞	÷		ć	9	ç	ò	9
(i) Below 15-T		15,000	20,000	20,000	10	07	9	01	90	Ç.	3
(i) Betower 15-T and 50-T	(B) Rear Dumpers										
(ii) Between 15-T and 30-T 10 8 5 5 0 40 10 70 120 120 120 16,000 16,000 16,000 16,000 16,000 16,000 16,000 16,000 16,000 16,000 16,000 16,000 16,000 16,000 16,000 16,000 16,000 12,000 12,000 16,000 12,000	the second of (i)	∞	9	5	i		;	•	í	Ş	,
(ii) Between 15-T and 50-T	(i) Below 15-1	8,000	10,000	10,000	A	⊋,	40	10	0/	120	140
(ii) Above 50-T . 12	T.03 bus T.21 Between 15.T and 50.T	10	∞ :	8	20	4	30	01	ş	120	170
(C) Highway Dumpers	1.00 THE T-01 HALLS (1.)	12,000	16,000	16,000	5		Δ¢	2	2	071	7
(C) Highway Dumpers	T 03 000 A (iii)	12	भव	œ		100	i,	3	1		;
CO Highway Dumpers 10 8 6 6 120 120 120 15,000 16,000 16,000 16,000 16,000 12,000 12,000 12,000 12,000 12,000 16,000		15,000	20,000	20,000	9		3	2	9	071	041
SCRAPERS (A) Motorised (Push loaded) (b) Upto 10 cu. yds. (i) Upto 10 cu. yds. (ii) Above 10 cu. yds. (iii) Above 10 cu. yds. (iv) Logo 1 cu. yds. (iv) Logo 1 cu. yds. (iv) Above 10 cu. yds. (vi) Above 10 cu. yds.	(C) Highway Dunners	10	∞	9	ç	3,	O.	Ģ	0,5	120	145
(A) Motorised (Push loaded) (b) Motorised (Push loaded) (c) Motorised (Push loaded) (d) Motorised (Push loaded) 8 6 5 30 40 10 80 130 130 10 8 6 (i) Upto 10 cu. yds. 10 8 6 (ii) Above 10 cu. yds. 10 8 6 (ii) Above 10 cu. yds. 10 8 6 (ii) Above 10 cu. yds. 10 8 6 (ii) Above 10 cu. yds. 10 8 6 (iii) Above 10 cu. yds. 10 8 6 (iv) Upto 10 cu. yds. 10 0 8 0 130 10 10 10 10 10 10 0 10 0 10 10 0 0 10 0 10 10 0 0 0		12.000	16,000	16,000	27	3	96	2	2	071	<u> </u>
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$											٠
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	(A) Motorised (Push loaded)										
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	CONTRACTOR OF	∞	9	5		ç	S	ç	G	5	(2)
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Copio io ca. yas.	10,000	12,000	12,000	5	Q.	9	2	00	061	001
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		10	∞	9	ş	č	ç	Ş	S	Š	9
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	(ii) Above 10 cu. yds.	12,000	16,000	16,000	Ŗ	Ç	P.	2	96	OC -	2
12.000 16.000 16.000 20 25 30 10 40 65 65 12.000 16.000 16.000 16.000	(R) Flavoting & call handed	10	∞	9	٥	χ.	30	10	120	300	240
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		12,000	16.000	16,000	ì	ì				<u> </u>	!
12.000 16,000 16,000		10	œ	9	ć	ż	00	2	Ę	37	7.5
	Towed (C)	12.000	16.000	16,000	O ₁	C.	25	2	7	3	3

-	2		3	4	\$C	9	7	œ	6	100	11	12
4 TR	TRACTORS											
€	(A) Crawler											
	G 11750 100 H P		∞	9	S	ž	ç	Ş	5		•	ç
	(1) Opto 100 1111:		10,000	12,000	12,000	3	OC.	₹	10	9	001	907
			10	80	9	•		,				
	(n) Above 100 H.F.		12,000	16,000	16,000	92	\$3	30	01	120	200	240
(B)	(B) Wheeled		∞	9	'n							
	(j) Upto 50 H.P.		10,000	12,000	12,000	25	30	40	10	50	82	100
	;		10	œ	9							
	(ii) Above 50 H.P.		12,000	16,000	16,000	20	25	30	10	20	82	100
			10	∞	9	080	4					
S GR	GRADERS		12,000	16,000	16,000	20	25	30	10	20	85	100
					व							
9 TC	6 LOADERS				नय							
₹	(A) Crawler Loaders ·	•	10	œ	9	20	25	30	10	120	200	240
			12,000	16,000	16,000							
(8)	(B) Wheeled Loaders		10	∞	9	20	25	99	01	20	85	100
Į.			12,000	16,000	16,000	ì	i	}	}	3	}	
ţ			16	12	10		ť	ç	\$	Ş	5	Ş
Ĵ	(C) Beit Loaders · ·		20,000	24,000	24,000	8	3	P.	2	₹	00	9
			23	18	15	ç	•	,	Ş	;	;	;
e	(D) Reclaimers and stackers ·		30,000	40,000	40,000	9	17.5	<u>s</u>	OI	€	8	9.
2 CO	COMPACTORS											
;	•	;	10	œ	9	á	Č	ç	Ş	Ş	í	ć
₹	(A) Self-propelled sheeptoot Kollers	Kollers	12,000	16,000	16,000	8	3	2	2	8	ę	2
			œ	9	5				,			
æ	(B) Drawn sheepfoot		8,000	10,000	10,000	25	30	04	10	9	%	70

12	80	80	98	80	100	001		80	80	80	80		08
111	70	02	70	70	85.	85		70	0.2	20	20		70
10	30	50	50	50	50	20		20	50	50	50		50
6	10	10	• • • • • • • • • • • • • • • • • • •	10	10	10		10	10	10	10		10
8	69	40	40	40	30	30		30	40	40	30		40
7	30	30	30	30	25	25	3	25	30	30	22		30
9	25	25	25	25	20	20		20	25	25	50		25
5	10,000	5 10,000	10,000	10,000	16,000	16,000	9	16,000	5 12,000	5 12,000	6.16,000	v	16,000
4	10,000	10,000	10,000	10,000	9 16,000	16,000	व जयते ∞	16,000	6 12,000	6 12,000	8 16,000	v	16,000
8	8,000	8,000	8,000	8 000,8	10,000	10,000	10	12,000	8 10,000	8 10,000	10	α	12,000
1 2	(C) Vibratory Rollers · · ·	(D) Smooth Drum Roller	(F) Smooth Drum Vibratory Roller	(F) Pneumatic tyred Roller .	(G) Highspeed Compactors .	8 WATER SPRINKLERS · ·	9 DRILLS	(A) Blast hole drills	(B) Core Drills · · ·	(C) Wagon Drills	(D) Tricone Rotary Drills ·	10 COMPRESSORS(A) Diesel Compressors:—	(i) Portable upto 300 Cfm.

1 2	3	4	5	9	7	8	6	10	11	12
(ii) Portable above 300 Cfm.	10	8 16,000	6 16,000	20	25	30	10	20	70	80
(B) Elect. Compressors:—										
(i) Portable upto 300 Cfm.	12,000	8 16,000	16,000	20	25	30	10	50	70	80
(ii) Portable above 300 Cfm.	12	10	8 20,000	91	20	25	10	20	70	80
(iii) Stationery	30,000	18 40,000	15 40,000	10	12.5	15	10	20	70	80
11 BLOWERS	18 22,000	30,000	30,000	12.5	IS G	17.5	10	50	70	08
12 COOLING PLANTS (i) Aggregate Cooling Plant · · · } (ii) Ice Plant · · · · J	60,000 hrs. or 20 years.		हैं (है) इसेंब ज्याने	muli	<u>.</u>		10		\$7	
 BATCHING AND MIXING PLANT (i) Cement Handling Batching and Mixing Plant. 	18	30,000	12	12.5	rani (C)	17.5	10	40	65	75
(ii) Transit Mixers · · · · }	10	×	9	20	25	30	10	20	85	100
(iii) Agitating Cars · · · J	12,000	16,000	16,000		·		į.			
(i) Diesel, Engine Driven	10,000	6 12,000	5 12,000	25	30	. 40	10	40	09	. 07
(ii) Electrical	15,000	20,000	20,000	16	20	25	10	40	09	70

11 12	09		85 100	85 100	06 08	75 80	100 100	120 140			100	100	85 100
10	40		50	<i>S</i> 2	50	20	70	7.0					20
6	10		. 10	01	10	10	10	10			10	10	10
∞	25		30	25	30	17.5	15.0	08					25
7	20		25	20	25	SI	12.5	25					20
9	16		20	16	20	12.5	10.0	50					16
5	8 20,000		9	15,000 8 20,000	9	30,000	40,000	9 16,000					8
4	10		8	10 20,000	8	15	40,000	16,000			2,50,000 K.M.	2,50,000_K.M.	10
3	12,000		1000 51	12,000	10	18	30,000	12,000			ú	4	15,000
1 . 2	S WELL POINTS	.6 CRANES	(i) Mobile (Pneumatic Wheeled 4 to 6 tons 8 to 12 tons	15 to 25 tons	(ii) Crawler Mounted upto 3 tons	Over 10 tons	(iii) Tower Crane	(iv) Truck Mounted	17 TRANSPORT EQUIPMENT	(A) Heavy Transport Vehicles.	(a) Trucks:— (i) Diesel upto 3-T Diesel 3 to 5-T 5-T and above	(b) Tractor Trailors Upto 5-T 5-T to 10-T	10-T to 25-T 25-T to 50-T 51-T and above

- 2		3	7	5	9	7	&	6	10	11	12
(B) Light Transport Vehicles	icles										
(i) Jeeps											
(ii) Station Wagons		_	1,60,000 K.M.					10		100	
(iii) Cars · •											
(iv) Ambulance Cars			4		Charles and the	£					
			464								
(C) Ariel Transport			Цq	1		100					
(i) Cable-ways	• •	C14	20 years. 40,000 hrs.		5.8	5 straight line		10		SS.	
i d)		à					
(D) Kail Hansport.											
(i) Locomotives:											
ć		01	∞	9	ć	į	. (Ş	{	Š	•
Diesel ·	•	12,000	16.000	16,000	Q.	૧	₹	O.	00	S.	₹
į		23	81	15	5		:	•	Ç 1	ì	
Flect. •	•	30,000	40,000	40,000	2	5:71	2	01	ž	<u>e</u>	<u>0</u>
(ii) Wagons ·		22	18	15	10	12.5	15	:	:	:	:
(iii) Rail Cars	•	30,000	40,000	40,000							

REPAIR EXPENDITURES ON MAJOR ITEMS OF EQUIPMENT FOR THE LAST 5 YEARS AS INTIMATED BY SOME OF THE PROJECTS

APPENDIN 8.5

Name of the Project and Category of Machine	ategor	y of N	fachir	ير	Nos.	, _G	Year of Purchase	Cost in lakhs	Earlier Years	1965-66	1966-67	1967-68	69-8961	1969-70
									Hours	Hours Worked	Hours Worked	Hours	Hours Worked	Hours Worked
									Expendi- ture	Expendi- ture	Espendi- ture	Expendi- ture	Expendi- ture	Expendi- ture
	-					7	m	4	5	9	7	8	6	10
Beas Unit. I Shovel 2.5Cyds	٠						1966	2.74	: : :		3.45	1,831	3.211	4.216
Shovel 2.5Cyds	•	•		•		e संद	1964	96.7		1,788	2,760	3,477	7.491	5.854
Rocker Shovel 1.5Cyds	• •	•	•	•		रमेव नय		2.05		388	846	1.109	1, 127	1.899
Tractor Cat. D-8	•	•	•			∞	1963	3 2.60	10 10	5,109	6,643	8.307	9.753	11.189
Beas Unit. H Shovel Elect. 7 Cyds.	•	•	•			-	1964	t 19.30	: :	4.511	8,629	10.853	14.825	19.818
Motor Grader	•	•				9	1965	0.80	0:	1,806	4.340	6.411	8.143	10.282
Tractor Cal. D-8	•		•			20	6961	3.90	: : 	: :	: :		2.573	6,302
Tractor Car. D-8		•		•		4	1963	3 2.33	5,000	7,662	9.888	11.873	14.115	15.136

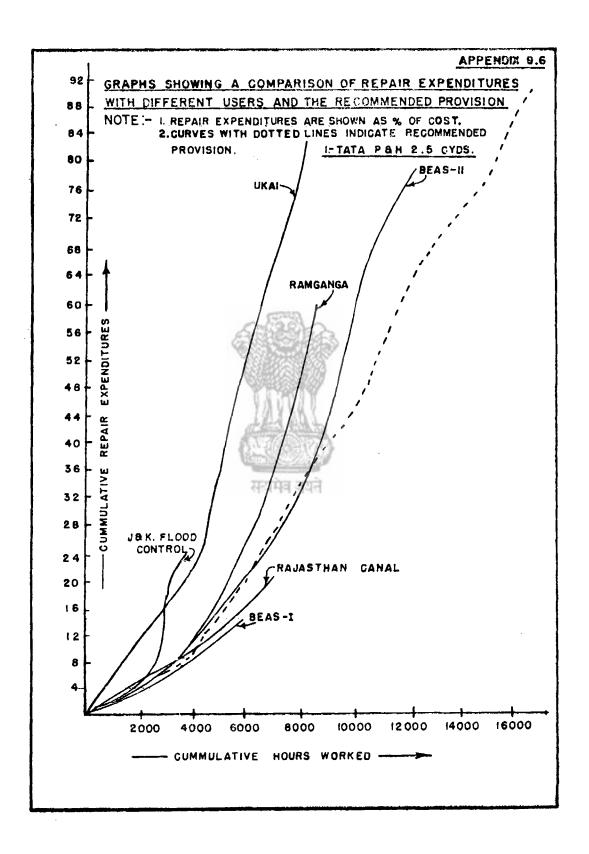
							94				
01	5,608	5.100	18,820	16,637	3,800	11,857	15.800	11,823	10.165	7,947	2,181
٧	1.102	4,343	18.231	15,907	837	9,874	14,500	10,694	6,395	6,194	97.9
×	: :	3,105	16,523	13,464	: :	7,644	12.200	8.321	: :	29.7	1,716
7	: :	1.488	13,395	9,030	: :	5.073	9.700	5.623	: :	2.955	1,363
9	: :	98	9,744	4,283	: :	2,849	6.200	2,271	: :	1,096	316
\$: :	: :	5.700	: :	: :		5,700		2,395	: :	: :
4	4.45	1.25	2.00	5.72	5.79	7.50	3.68	3.68	26.57	6.70	0.81
m	1969	1966	1963	1964	1969	1965	1963	1965	1966	1962	1957
7	13	7	Ξ	œ	50	स	यमेव जय	ते 🗸	1	9	32
							•				
		•		•			•				
	•			•				•			
٦			٠				•			Ġ.	
į	-	(Cr)	•		•			•	•	2.5Cy	
	Dumpers (Rear)	Loader Front End (Cr)	Dumpers Bottom	Dumpers Bottom	Dumpers Bottom	Shovels 2.5Cyds	Tractor Cat. D-9	Tractor Cat. D-9	Ramgungu Shovel 7 Cyds	<i>Ukai</i> Shovel Tata P&H 2.5Cyds.	Scrapers Let.

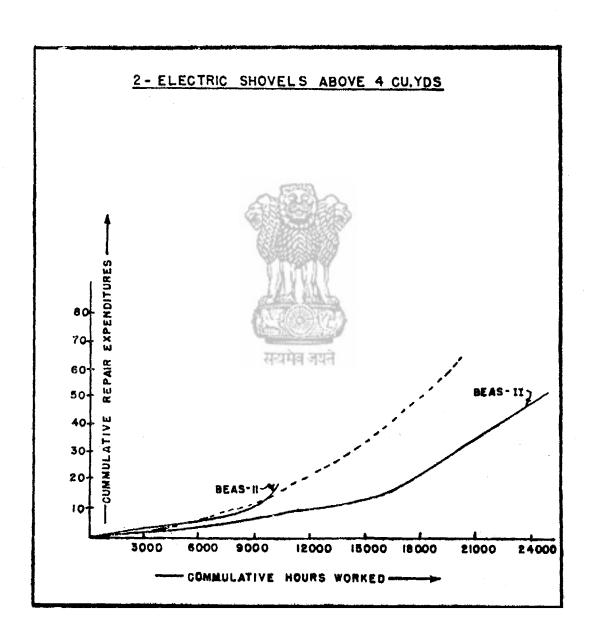
	-				2	3	4	\$	9	7	8	6	10
Scrapers V.C. (New)					45	1967	5.52	: :	: :	: :	306	1,462	3,298
Dumpers V.C. (New.)	•	٠			28	1967	5.38	: :	: :	: :	18	592	2,093
Dumpers Cat. 619-C			•		7	1965	2.50	: :	1,240	2,756	4,029	5,237	6,683
Loader Emico (Cr.)	٠				ĸ	1966	69.0	: :	: :	763	2,042	3,435	4,931
Tractor Cat. D-9					m	1965	4.13	: :	871	2,000	3,041	4,612	6,314
Tractor Cat. D-8				•	सह १1	1965	2.23		5.86	1,038	1,735	3,120	5,125
Motor Grader Galion Balimela					मिव जयते	1958	0.55		2.95	10.5	35.4	1,446	2,067
Shovel 1.25Cyds.					% .	1963	3.15	: :	4,876	5,817	6,248	6,437	6,437
Shovel Elect. 4.6Cyds.					'n	1965	15.57		576	1,450	5.64	3,552	5,330
N. S. Left Canals Scrapers Let. 'C'					¢1	1957	2.02	6,926	7,760	8,298	8,656	9,239	9,448
Scrapers Let. 'C'		•			ž.	5961	2.05	: :	832	3.86	2,831	3,624	4,141
Scraper Let.					01	1963	1.86	2,784	8.70	5,550	6,300	7.100	7,400

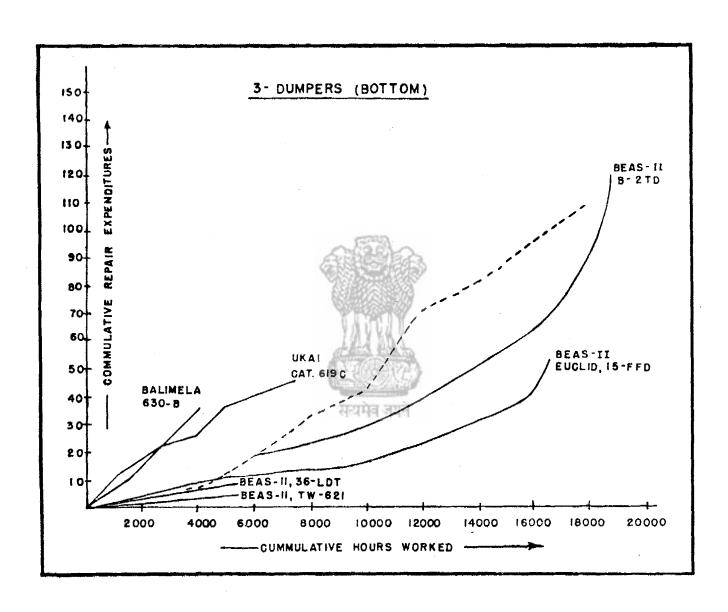
					9	6				
10	4.102	6,796	888	6,180	805	1,600	2,412	4,597	4.193	12,200
6	3,987	6,188	3.8	5,805	700	1,395	2,112	4,310	3,334	11,550
8	3,530	5,351	3.20	5,140	625	1100	1,778	3,940	2,846	10,700
7	3,530	5,012	782	4,158	450	805	1,015	34.1	2,138	10,100
9	2,501	4,266	431	3,516	3.7	300	310	1,880	1,300	9,500
'n	1,916	3,424	: :	2,670	A		: :	: :	: :	8,500
4	1.64	1.67	0.90	1.64	1.04	1.03	1.65	1.28	7.25	2.34
m	1958	1957	1965	1958	1964	1966	1965	1964	1965	1961
C 1	-	m		Cl	स्यमे	व जयते	1	1		=
							•			
		•	•			•	•	•	•	•
			•	•		•	•	٠	•	•
-				•	•	•	•	•	•	•
		•	٠	•	•	•	•	•	•	
			at.		•	•	٠		•	" W-20
	Tractor Cat. D-8	Tractors Cat. D-7	Motor Grader Cat.	Tractors Cat. D-7	Srisailum Dumpers Euclid	Dumper's Euclid	Tractor TD-24	Tractor Cat. D-7	Shovel P & H.	Perambikulam Aliyar Scrapers Car. DW-20

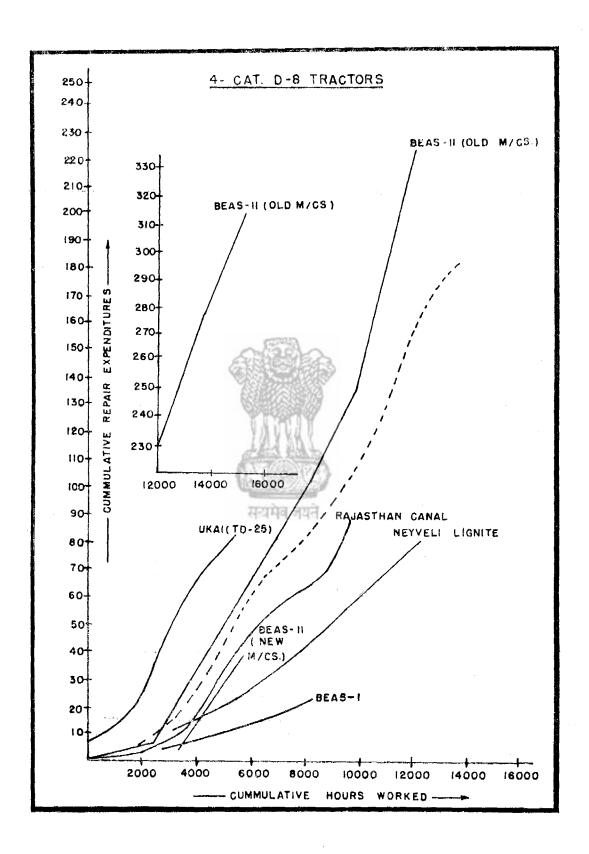
14-	_			2	3	4	5	9	7	∞	6	10
ફે -4 C₩	yakawadi											
/&PC/ND	Notor Graders Cat			N	1960	2.60	3,300	3,346	3,490	3,914	4,493	10.6
) _j 75	Loaders Front End (Cr.) .			9	1966	2.46	: :	: :	331	1,580	2.546	3,556
	Scrapers Cat.		•	9	1965	2.12	: :	1,255	2,072	3,712	6,033	8,039
	Fractors Cat. D-8			20	1967	6.02	: :	: :	: :	222	1,339	2,427
Ne	Neyweli Lignite			सय			AN					
	Motor Graders Cat		•	मेव जय	1966	Bel 1.01 cxj	Before 1968 hours 2536 and expenditure 8%	irs 2536 and		3,791	5,487	7,126
	Tractors Cat. D-8	•	•	15	9961	2.00	23	• -	: :	3,122	6,644	9,594
	Dumpers Cat. 630-B.		•	∞	9961	4.34	: :		: :	1,519	3,965	6,149
	Dragline P & H 1.5Cyds.	•	•	_	1963	2.50	: :	: :	: :	1,203	3,917	5,165
Him	Hindustan Steel Ltd. Cranc P & H	•	•	4	1964	2.97	:	3.10	3,700	7.46	4,500	4,700
	Tractor Crane	•	٠	ν,	1964	0.42	1,231	3,246	3.77	5,222	5,480	5,480
1												

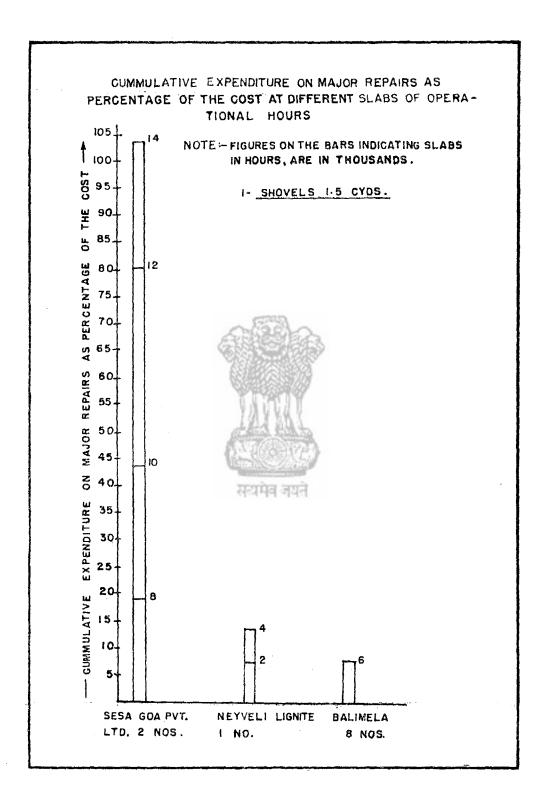
					2	3	ব	5 6	, -	,	oc oc	6	10
Sesa Goa Pst. Ltd.													
Shovel Tata P & H 955-A					6 1	1965	6.85	: :	2,269	İ	4,294	6,243	8,088
Shovel Lima 1.5Cyds	•	•			د 4	1960	3.49	Before 1967 hours 7605 and Expenditure 15%	9,204	26 1.8	10,590	11,939	13,559
Dumpers Mack M-20-X .	•	•	•		यमेवु ज	1966	3.55	466	2,528		4,656	6,739	: :
Tractor D-9	•	•		•	पते 😝	1963	3.74	$\begin{array}{c} 0.20\\ \text{Before 1967 hours 11727}\\ \text{and Expenditure 60}\% \end{array}$	0 13,780 7 33.5	5 127.4	541	18,079	20,388
Motor Grader Galion	•	•				1962	0.92	Before 1967 hours 4196 and Expenditure 20%	6,471	1	47.4	11,691	13,794
Dumpers Euclid R-22	•	•	•	•	7	1967	4.37				: :	2,234	4,970

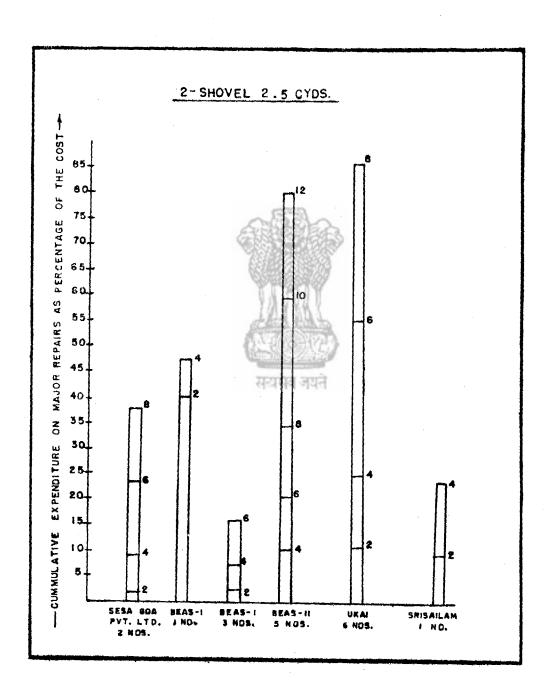


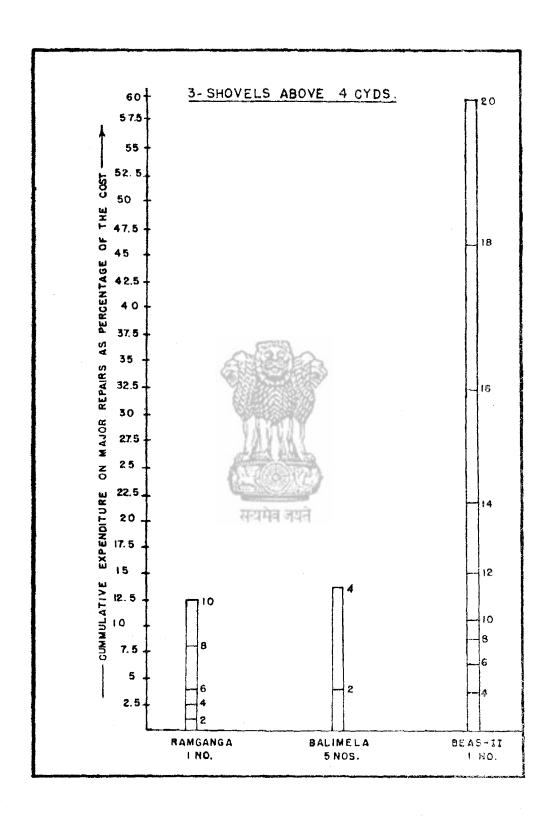


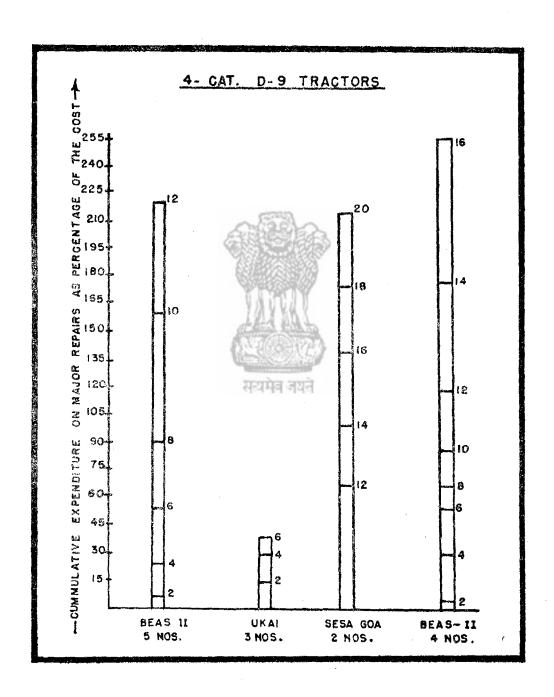


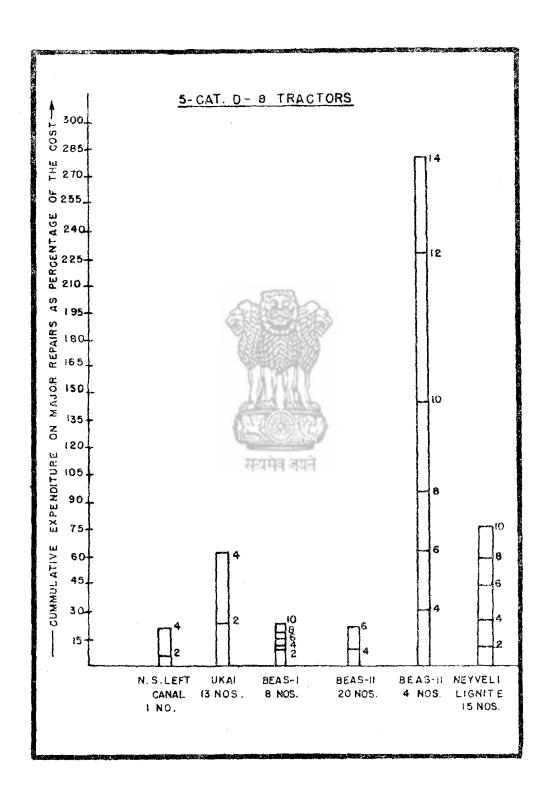


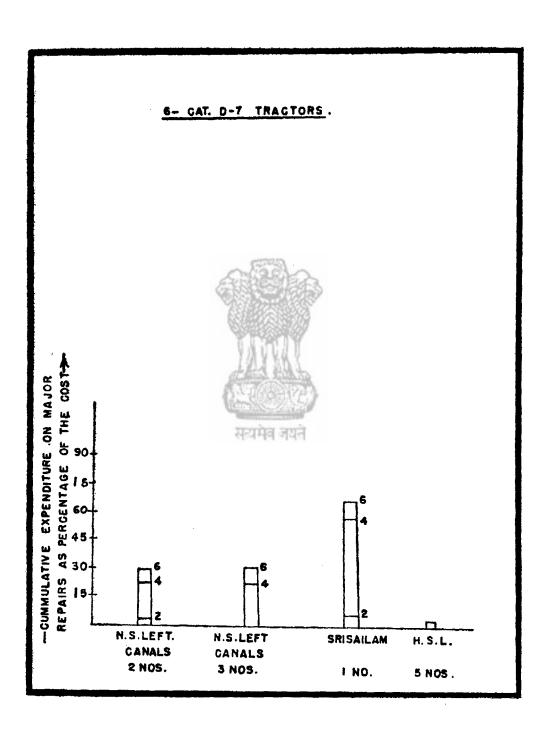


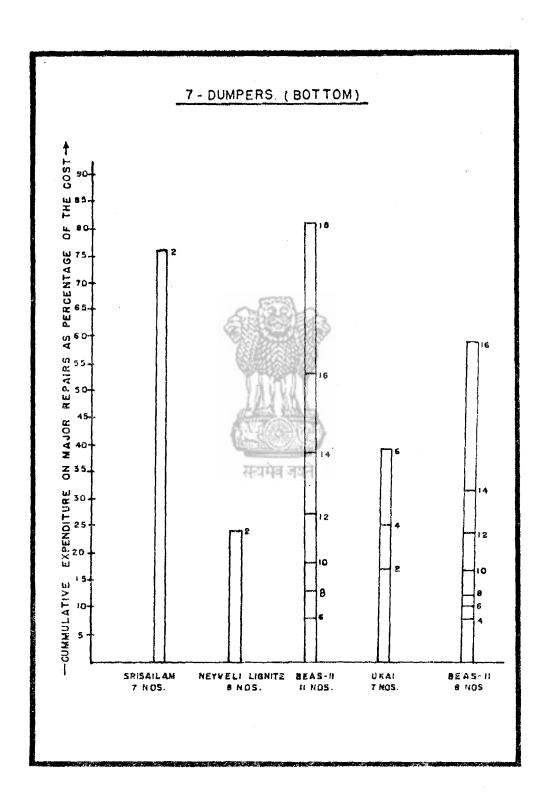


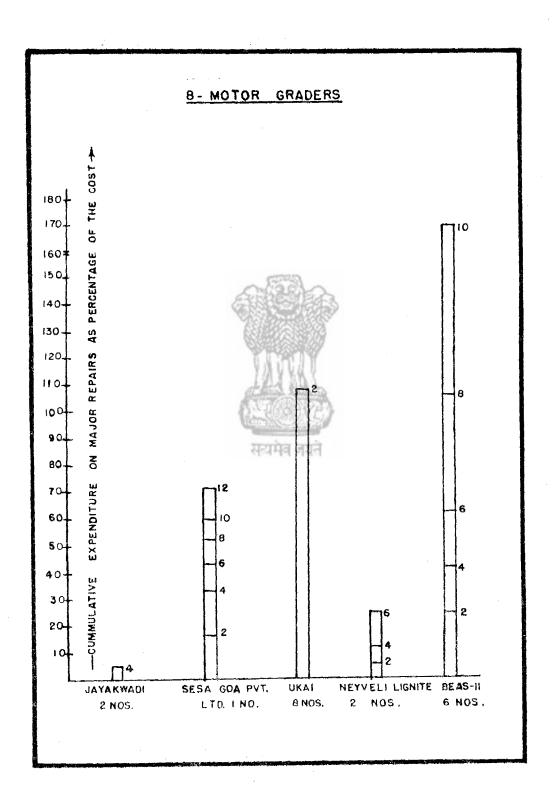


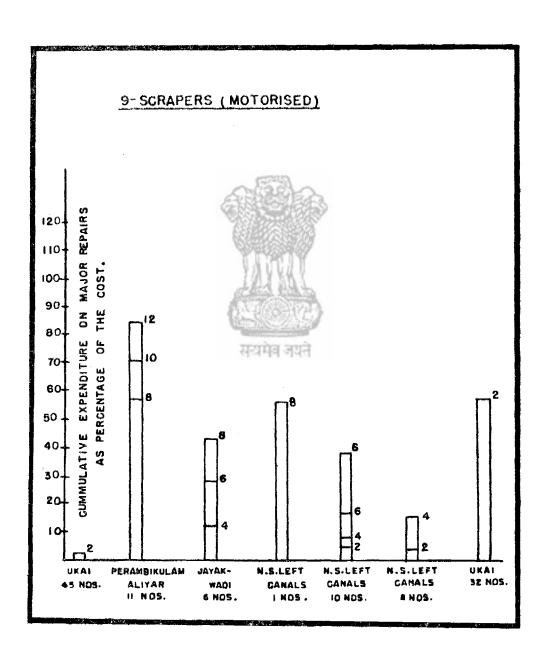












Appendix 8 · 7
REPAIR PROVISION (MAJOR & FIELD COMBINED) (WITH AVERAGE OPERATING CONDITION)

(Category of Equ	uipment	1 & S1	age	of life	in ho	ours	R	epair provision as percer	ntage of Cost of equipment
								•	For the stage	Cumulative
			1						2	3
	Crawler Trac	tors							- · · · · · · · · · · · · · · · · · · ·	
	2,000								5	5
	4,000	-							20	25
	6,000								35	60
	8,000							•	20	80
	10,000								30	110
	12,000							•	10 ⊣-40	120 -40
	14,000	•	• .						25	185
	16,000								15-+15	200-15
	18,000			٠					20	235
	20,000	•			•		•	•	15	250
	Cinal	e Shift	_12 (ነሰሴ ፣	1rc 1	20.07				
		ble Shifi								
		e Shifts						-	77(25)	
	THE	o ismitis	1	.,UU	v 1115−	-240)	/o	onli	2010	
								CHARLE STATE		
	Motorised Sci	ranere						Chil	DHI WEST	
		rape (A						SSTEE		
	2,000	•	•	•	•	•	•	DAM.	5	5
	4,000	•	•	•	•	•	•	-0.4	10	15
	6,000	•	•	•	•	•	•	1.9	15	30
	000,8	•	•	•	•	•		ot his	25	55
	10,000	•	•	٠	٠	•	•	ALC: T	15	70
	12,000	•	•	•	•	•	•	March 1	10-1-25	80 + 25
	14,000	٠	•	٠	•	•	•		15	120
	16,000	•	-	•		٠	•	स्य	10+15	130-1-15
	18,000	•	•	•	٠	•	•	•	20	165
	20,000	•	•	•	•	•	•	•	15	180
	Single	e Shift	12	2,000) hrs	-80%				
	Doub	ole Shift	10	6,000	hrs-	1309	6			
		Shifts								
	Elevating Scra	ipers (M	l otoris	sed)						
	2,000								5	5
	4,000								20	25
	6,000								35	60
	8,000	,							20	80
	000,01								30	110
	12,000							•	10+40	120 40
	14,000								25	185
	16,000						•		15-1-15	200-}-15
	18,000								20	235
	20,000	•						•	15	250
		Shift				-120 %				
		le Shift								
	Three	Shifts	-16	5.000	hrs_	-240°	/			

	1		<u> </u>				2		3
. Towed Sci	apers								
2,000							2.5	2	· 5
4,000						•	5.0		1.5
6,000	, .						7.5	15	5.0
8,000						•	15.0	30	0.0
10,000							5.0	35	.0
12,000							5·0+15		+-100
14,000	•						5	60	
16,000	٠.						5-1-10	65	- ⊢1 0
18,000							10	85	
20,000				٠			5	90	
	ngle Shift	12,0	00 hrs-	-40%					
	ouble Shif								
	ree Shifts								
Dumpers, 2,000	xear						2.5	2.	:
4,000	-				£	14131	7.5	10	5
6,000					62	SHE	15.0	25	
8,000					A.		20.0	45	
10,000					16		15.0	. 60	
12.000							1 11 19		25
14,000	•		•	·			10+25	70-	F23
	·		•	•	B	No.	15	110	15
16,000			•	•	- (2)	4	10+15 15	120-	-13
18,000	•		•	•	. "			150	
20,000	•		•	•	- 3	प्रथमव	जयते0	160	
		12,00							
	uble Shift								
Thr	ee Shifts	16,000	hrs—	-140%					
Dumpers Bo	ttom								
2,000				•			2.5	. 2.:	5
4,000				v			5.0	7•.	
6,000							10.0	17~5	
8,000					•	•	15.0	32.5	
10,000						•	10.0	42.5	
12,000							7-5+20	50-1	
14,000		•					10.0	80	
16,000							5+10	85+	10
18,000							15	110	
20,000				٠			10	120	
	le Shift	-12,000	hrs	50%					
	ble Shift								
		,		7.0					

							2	3
	Wheel Tractor	·s						
•	2,000						2.5	2.5
	4,000	·		-			5.0	7.5
		•		•	•			17.5
	6,000	•		•	•	• •	10	32.5
	8,000	•		•	•		15	
	10,000	•	•	•	•		10	42-5
	12,000	•		•	•		7·5 ├ 20	50±20
	14,000	•			•		10	80
	16,000				•		5+10	85 + 10
	18,000			•			15	110
	20,000	•					10	120
	Doub		12,00 16,00 16,00	0 hrs-	- 85%			
	Wheel Loader	S						
	2,000			•			2.5	2.5
	4,000						5.0	7.5
	6,000						10	17.5
	8,000						15	32.5
	10,000						10	42.5
	12,000						7.5+20	50-1-20
	14,000 14,000					Sil	10	80
		•		•	-	(2.60x)	5+10	85-j-10
	16,000	•		•	•	200		110
	18,000	•		•	•	6814	. 15 10	120
			12,0				the Ha	120
	Singl Dou	ble Shif	12,0 116,0 16,0	00 hrs-	- 85%			120
Đ.	Singl Dou	ble Shif e Shifts	i —16,0	00 hrs-	- 85%			
).	Sing Dou Thre	ble Shif e Shifts	i —16,0	00 hrs-	- 85%		ामेन जड़ने	5
).	Single Double Three	ble Shif e Shifts	i —16,0	00 hrs-	- 85%	THE STATE OF THE S		5 25
) .	Single Double Three Crawler Load 2,000	ble Shif e Shifts	i —16,0	00 hrs-	- 85%	H.	ामेन जड़ने	5 25 60
Э.	Single Double Three Crawler Load 2,000 4,000	ble Shif e Shifts	i —16,0	00 hrs-	- 85%	H	20 35 20	5 25 60 80
) .	Single Double Three Crawler Loud 2,000 4,000 6,000	ble Shif e Shifts	i —16,0	00 hrs-	- 85%	H.	5 20 35	5 25 60 80 110
ο.	Singl Dour Thre Crawler Load 2,000 4,000 6,000 8,000 10,000	ble Shif e Shifts	i —16,0	00 hrs-	- 85%	H.	20 35 20	5 25 60 80 110 120 40
1 _	Singl Dour Thre Crawler Load 2,000 4,000 6,000 8,000 10,000 12,000	ble Shif e Shifts	i —16,0	00 hrs-	- 85%	THE STATE OF THE S	5 20 35 20 30	5 25 60 80 110
)_	Single Double Three Three Crawler Load 2,000 4,000 6,000 8,000 10,000 12,000 14,000	ble Shif e Shifts	i —16,0	00 hrs-	- 85%	THE STATE OF THE S	5 20 35 20 30 10+40 25	5 25 60 80 110 120 40
	Single Double Three Crawler Load 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000	ble Shif e Shifts	i —16,0	00 hrs-	- 85%		5 20 35 20 30 10+40 25 15+15	5 25 60 80 110 120 -40 185
)_	Single Double Three Crawler Load 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000 18,000	ble Shif e Shifts	i —16,0	00 hrs-	- 85%		5 20 35 20 30 10+40 25 15+15	5 25 60 80 110 120 -40 185 200 -15
9.	Single Double Three Crawler Load 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 Sing Double County Three Crawler Load 18,000 Sing Double County Three Crawler Load 18,000 Sing Double County Three Crawler Load 18,000 Sing Double County Three Crawler Load 18,000 Sing Double County Three Crawler Load 18,000 Sing Double County Three Crawler Load 18,000 Sing Double County Three Crawler Load 18,000 Sing Double County Three Crawler Load 18,000 Sing Double County Three Crawler Load 18,000 Sing Sing Sing Sing Sing Sing Sing Sing	ble Shifts ders ders ders ders	i —16,0	00 hrs- 00 hrs- 00 hrs-	- 85%100%		5 20 35 20 30 10+40 25 15+15	5 25 60 80 110 120 +40 185 200 +-15 235
	Single Double Three Crawler Load 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 20,000 Sing Double County Three Crawler Load 18,000 Sing Double County Three Crawler Load 18,000 Sing Double County Three Crawler Load 18,000 Sing Double County Three Crawler Load 18,000 Sing Double County Three Crawler Load 18,000 Sing Double County Three Crawler Load 18,000 Sing Double County Three Crawler Load 18,000 Sing Double County Three Crawler Load 18,000 Sing Double County Three Crawler Load 18,000 Sing Double County Three Crawler Load 18,000 Sing Sing Sing Sing Sing Sing Sing Sing	ble Shifts ders ders ders ders	16,00	00 hrs- 00 hrs- 00 hrs-	- 85%100%		5 20 35 20 30 10+40 25 15+15	5 25 60 80 110 120 -40 185 200 -15 235
	Single Double Three Crawler Load 2,000 4,000 6,000 10,000 12,000 14,000 16,000 20,000 Sing Double Three Crawler Load Three Crawler Load 16,000 18,000 16,000 Three Crawler Load 16,000 Three Crawler Loa	ble Shifts ders ders ders ders	16,00	00 hrs- 00 hrs- 00 hrs-	- 85%100%		5 20 35 20 30 10+40 25 15+15	5 25 60 80 110 120 1-40 185 200-1-15 235 750
	Single Double Three Crawler Loud 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000 18,000 20,000 Sing Double Craders	ble Shifts ders ders ders ders	16,00	00 hrs- 00 hrs- 00 hrs-	- 85%100%		5 20 35 20 30 10+40 25 15+15 20 15	5 25 60 80 110 120 1-40 185 200-1-15 235 7.5
	Singl Dour Three Crawler Loud 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000 18,000 20,000 Sing Dou Three	ble Shifts ders ders ders ders	16,00	00 hrs- 00 hrs- 00 hrs-	- 85%100%		5 20 35 20 30 10+40 25 15+15 20 15	5 25 60 80 110 120 -40 185 200 -15 235 7.5 17-5
	Singl Dour Three 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000 Sing Dou Three 2,000 4,000 6,000	ble Shifts ders ders ders ders	16,00	00 hrs- 00 hrs- 00 hrs-	- 85%100%		5 20 35 20 30 10+40 25 15+15 20 15	5 25 60 80 110 120 1-40 185 200-1-15 235 7.5
	Singl Dour Three Crawler Loud 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000 18,000 20,000 Sing Dou Three	ble Shifts ders ders ders ders	16,00	00 hrs- 00 hrs- 00 hrs-	- 85%100%		5 20 35 20 30 10+40 25 15+15 20 15	5 25 60 80 110 120 -40 185 200 -15 235 7.5 17-5

		1				2	 3	
14,000	, ,	•	•	•	•	10	80	
16,000		•	•	•	•	5+10	85-j-10	
18,000		•	• .		•	15	110	
20,000		•	•		•	10	120	
Sing	le Shift -	12,000	hrs :	50%				
Dot	ble Shift -	-16,000	hrs 8	85%				
Thr	ee Shifts -	16,000	hrs—10	00%				
. Excavators i	pto 2½ си. "	yds, (Die	esel)					
2,000			,			2.5	2.5	
4,000					•	7.5	10	
6,000		•				10	20	
8,000					•	15	.35	
10,000					•	10	45	
12,000						5-[-15	50 -15	
14,000	,				•	10	75	
16,000			•			5-1-10	80÷10	
18,000						10	100	
20,000					- Em	10	110	
			. •	2001	SHE	STEAR .	110	
			hrs— :			17833		
	ible Shift -				10192	SERVICE OF THE PROPERTY OF THE		
Thr	ee Shifts -	-16,000	hrs—!	00%				
Excavators	ubove 2½ cu	. yds. to	4 cu. y	ls. (Dies	sel)			
2,000		•	•	•	JAMA I	2.5	2.5	
4,000		•	• ,			2.5	5	
6,000		•	•	·	T. Hill	5.0	10	
8,000		•			or the live	7.5	17.5	
10,000		٠.	•		mina	7.5	. 25	
12,000					संध्यम्	10.0	35	
14,000						10.0	45	
16,000						5+10	50+10	
18,000						10	70	
20,000						5- -10		
						10	75-1-10	
.22,000		•					95 -	
24,000	•	•	•	•	•	5	001	
			hrs50					
	ble Shift -							
Thr	e Shifts -	20,000	hrs—80)%		•		
Excavators a	bove 4 cu. 3	ds, (Die	sel or D	iesel Ele	ectric)			
2,000		•	•			—	No. Codelle	
4,000		•	•		•	2.5	2.5	
6,000			•		•	2.5	5.0	
8,000		•	•		•	2.5	7.5	
10,000			•		•	5.0	12.5	
12,000						5.0	17-5	
						7.5	25.0	
						10.0	35.0	
14,000	•		•			10.0		
14,000 16,000								
14,000 16,000 18,000		•					45.0	
14,000 16,000					•	5+10 10	50+10 70	

			1				2	3
24,000	•	•	•	•	•	•	5÷5	75 -5
26,000	•			•	•	•	10	90
28,000							5	95
30,000							5	100
Sin	gle Shift	20,0	00 hrs-	50%				
Do	uble Shif	ı24,0	00 hrs-	75 %				
	ree Shifts							
1 Evanuatore	abova A a	u vde (#	Ilantrio	.)				
1. Excavators	avove 4 C	u. vas. (L	aeciric	,				
3,000	•			•	•		1.0	1,0
6,000 9,000	•		•		•		1·5 5·0	2.5
12,000					•		7·5	5·0 12·5
15,000							10.0	22.5
18,000							10.0	32.5
21,000							7.5	40.0
24,000							15.0	55.0
27,000			•		1	1.50	10.0	65.0
30,000			•		628	RE	5+5	70 ⊣- 5
33,000	•		•	•	100		10	85
36,000	•	•	•	•	- 63		7 ·5	92.5
40,000	•		•	•	16	SPREE	7 ·5	100
Sin	gle Shift	30,00	00 hrs-	- 70%	,	9 Mil	THT	
	uble Shift					LYLL	707	
Thr	ce Shifts	40 , 00	00 hrs-	–100 %	6	4		
. Compactors					7	TOTAL DE	a and	
2,000	•		•	•		dod d	1 5 2 . 5	2.5
4,000	•	•	•	•	•	•	5.0	7.5
6,000	•	• •	•	•	•	•	10.0	17.5
8,000	•		•	•	•	•	15.0	32.5
10,000	•		•	•	•	•	10.0	42.5
12,000	•		•	•	•	•	7 - 5 20	50-{ 20
14,000	•	•	•	•	•	•	10	80
16,000	•		•	•	•	•	5-1 10	85+10
18,000	•		•	•	•	•	15	110
20,000	•	•	•	•	•	•	10	120
Dou	gle Shift ible Shift se Shifts	16,00	0 hrs-	- 85%				

Note: 1. Repair Provision includes cost of Labour and Spares.

^{2.} Excalation in Price of spare parts and the Inventory carrying cost (which includes the cost of obsolescnce) have not been accounted for.

^{3.} Figures after 4 (plus) signs indicate the value of component replacement at the stages.

^{4.} The figures of provision indicate the likely expenditure on repairs at different stages. This does not indicate the stocking pattern of spare parts.

APPENDIX 8-8

MULTIPLYING FACTOR TO THE PURCHASE COST FOR ESTIMATING REPAIR PROVISION DURING THE
LIFE TIME OF EQUIPMENT AT DIFFERENT OPERATING CONDITIONS

SI. No.	Category of	Equi	ipmen	t		Single Sh Conditio		ating	Double : Condition	Shift Ope on	rating	Three Conditio	Shifts O	perating
						E	Α	S	E	A	S	E	A	S
1.	Crawler Tractor		:			0.9	1.2	1.7	1.6	2.0	3.0	2.0	2 · 4	3.6
2.	Drawn Scraper			٠		0.3	0.4	0.6	0.50	0.65	1.0	0.6	0.75	1.1
3.	Wheel Scraper			•		0.6	0.8	1 · 2	0.9	1.3	1.8	1 · 2	1.5	2.3
4.	Bottom Dumper				•	0.4	0.5	0.7	0.6	0.85	1.2	0.95	1.0	1.4
5.	Rear Dumper					0.5	0.7	0 · 1	8.0	1 · 2	1.6	1.0	1.4	2.0
6.	Wheel Tractor					0.35	0.5	0.75	0.6	0.85	1 · 3	0.75	1.0	1.6
7.	Track Loader					0.9	1.2	1 · 7	1.6	2.0	3.0	2.0	2 · 4	3.6
8.	Wheel Loader					0.35	0.5	0.75	0.6	0.85	1 · 3	0.75	1.0	1.6
9,	Grader				•	0.3	0.5	0.70	0.50	0.85	1.1	0.6	1.0	1.3
10.	Compactor ·					0.35	0.5	0.75	0.6	0.85	1 · 3	0.75	1 · 0	1.6
11.	Excavator:						an F	180	2					. •
	(i) Electric, 4 cu	•			•	0.4	0.7	6.8	0.6	1.0	1 · 2	0.6	1 · 0	1 · 2
	(ii) Electric 2·5	to 4 c	u. yds		•	0.3	0.5	0.7	0.5	0.75	1.0	0.5	0.8	1.1
	(iii) Diesel 4 cu. y	yds. a	nd ab	ove	٠	0.3	0.5	0.7	0.5	0.75	$1 \cdot 0$	0.5	0.8	1.1
	(iv) Diesel 2.5 to	4 cu	. yds.	•	•	0.4	0.5	0.75	0.6	0.75	1 · 1	0.6	0.8	1.2
	(v) Diesel upto 2	2.5 cu	. yds.	•	•	0.4	0.5	0.75	0.6	0.80	1.2	0.7	0.9	1.3

Note.—'E'==Excellent, 'A'==Average and 'S'=Severe.

APPENDIX 8-9
CLASSIFICATION OF JOB CONDITIONS AS LIGHT, MEDIUM & SEVERE

	Sig	gnificance of job conditions	
Equipment	Light	Medium	Severe
1	2	3	4
Crawler Tractors .	 Pulling scrapers, most agri- cultural drawbar, stock- pile. coalpile and landfile work. No impact. Inter- mittent full throttle opera- tion. 	Production dozing in clays, sands, gravels. Push-loading scrapers, borrow pitripping most land-clearing and skidding applications. Medium impact conditions.	Heavy rock ripping. Tendem ripping. Push-loading and dozing in hard rock. Work on rock surfaces. Continuous high impact conditions.
Wheel Scrapers · ·	 Level or favourable hauls on good haul roads. No impact, Easy loading ma- terials. 	Varying loading and haul road conditions. Long and short hauls. Adverse and favourable. Some impact. Typical road-building use on a variety of jobs.	High impact condition, such as loading ripped rock. Over loading. Continuous high total resistance conditions. Rough haul roads.
Off Highway Dumbers (Rear and Bottom)	Mine and quarry use with properly matched loading equipment. Well maintained haul roads. Also construction use under above conditions.	Vasying loading and haul road conditions. Typical road-building use on a variety of jobs.	Consistently poor hauf road conditions. Extreme over-loading. Oversized loading equipment.

ŀ		2	3	4
Track Loaders		Intermittent truck loading from stockpile. Minimum travelling, turning. Free flowing, low density materials with standard bucket. No impact.	Bank exeavation, intermittent ripping, basement digging of natural bed clays sands, silts, gravels. Some travelling. Steady full throttle operation.	Loading shot rock, cobbles, glacial till, caliche. Steel mill work. High density materials in standard bucket. Continuous work on rock surfaces. Large amount of ripping of tight, rocky materials. High impact conditions.
Wheel Tractors ·		Light utility work. Stock- pile work. Pulling com- pactors. Dozing loose fill, No impact.	Production dozing, push- loading in clays, sands, silts, loose gravels. Shovel clean-up. Compactor use.	Production dozing in rock Push-bading in rocky, bouldery borrow pits. High impact conditions.
Wheel Londers	•	Intermittent truck loading from stockpile, hopper charging on firm, smooth surfaces. Free flowing, low density materials. Utility work in governmental and industrial applications. Light snowplowing.	Continuous truck loading from stockpile. Low to medium density materials in properly sized bucket. Hopper charging in low to medium rolling resistance. Hoading from bank in good digging.	Loading shot rock (large loaders). Handing high density materials with counterweighted machine. Steady loading from very tight banks. Continuous work on rough or very soft surfaces.
Grader • •		Light road maintenance. Finishing. Plant and road mix work. Light snow-plowing. Large amounts of travelling.	Haul road maintenance. Road construction, ditching. Loose fill spreading. Land- forming. landlevelling. Sum- mer road maintenance with medium to heavy winter snow removal. Ele- vating grader use.	Muintenance of hard packed roads with embedded rock. Heavy fill spreading. Ripping-scarifying of asphalt or concrete. Continuous high load factor. High impact.
Compactors (Wheel T	Type) •	Light utility work. Stock- pile work. Pulling com- pactors. Dozing loose fill. No impact.	Production dozing, push- loading in clays, sands, silts, loose gravels. Shovel clean up. Compactor use.	Production dozing in rock. Push-loading in rocky, bouldery borrow pits. High impact conditions.
Excavators •		Loose, soft, free running ma- terials. Close lying, which will fill dipper or bucket full.	Materials requiring some breaking up by light blasting or shaking. More bulky and somewhat hard to penetrate, causing voids in dipper or bucket. Harder materials that are not difficult to dig without blasting but break up with bulkiness, causing voids in the dipper or bucket.	Blasted rock, hardpan, and other bulky materials, which cause considerable voids in dipper or bucket and difficult to penetrate or load.

APPENDIX 8·10

ESTIMATED MAN HOURS REQUIRED FOR COMPLETE OVERHAULS OF EQUIPMENT AND COMPONENTS

	*	Edisen a cumo	India Ltd.	Deas		N.M.D.C.	9 7	Neyvell
(a) Caterpillar Diesel Engines with starting Engines.	ngines.					- Aprilla April - Apri		
D-7		325	333.8	160		288		350
D-8		385	338.5	D8.H200 D8160		288		350
D-9		430	435.5	200		288		350
(b) Caterpillar Fractors with attachment.								
D-7		1055	1198	009		2500		1200
D-8		1365	1514	D-8.H-800		2500		1200
D-9		1560	1821			3000		1200
	Larsen Toubro	214	В	Beas	N.M.D.C.		Neyveli	veli
D-9	D-8	D-7 D-9) D-8	D-7 D-9	D-8 D-7	D-9	D-8	D-7
(c) Caterpillar Track Assembly and Components	ents.		Š					
Link 60	50	42 4-30	0 .4-30	4-30	32	:	32	:
Rollers 68		40 15	5 15	15	2	:	10	;
Idlers 68	\$0	40	:	:	91	:	32	:
Sprockets 68		,		12	32	:	64	:
		42 48	3 48		64	:	96	:
ollers		40	:	, ,	:	:	:	:
Bushing 60	20	42	:	:	:	:		,
(d) To Re-assemble Caterpillar Track Assembly	ably and Components.	nents.						
Links 70	09	50 1	15 15	51	:	:	32	:
Rollers 70	09 0		96 96	96	48	i	52	:
Idlers 70	09		15 15	1.5	84	:	32	:
Sprockets 120				:	.; 8tr	:	64	:
		30 4	48 48	84	84	:	96	:
Carrier Rollers 70			:	:	:	:	:	;
Bushing 70	99	50	:					

AVERAGE MAN HOURS REQUIRED FOR REBUILDING OF WORN OUT TRACK COMPONENTS

APPENDIX 8.11

			7	Larsen Toubro	ro	Ţ	Tractors India	ıdia	8	Ramganga			Beas	ä			Neyveli
			D-0	D-9 D-8 D-7	D-7	D-9	D-9 D-8	D-7	6-Q	D-8	D-7	D-0	D-8	D-7	D-8	D-7	D-9
Link .			09	04	36	29	23	81	:	:	:	<u>=</u>	78	62	84	40	:
Rolfer Set.	-		. 42	33.5	22.5	32	26	19	7.5	4	:	28	20	15	48	32	96
Idlers .			. 17	13	6	11	10	9	51	45	:	œ	œ	9	32	24	40
Sprockets .				. 12	10	20	91	12	96	72	:	:	:	:	96	45	9
Grousers .			. 66.5	5 60	52	78	99	49	468	392	:	:	:	:	:	:	32
Carrier Rollers			:	:	:	œ	ç	9	6	4.5	:	9	4	ю	:	:	:

REQUIREMENTS OF WELDING MATERIAL AND FLUX FOR REBUILDING IN KG.

		Larsen	arsen Toubro	सत्यम	Tractor	Fractors India		Œ	Beas		Ramganga	เกซูล		Ž	Neyveli		Rajas	Rajasthan Canal Project	anal
		D-9	D-8 D-7	1	D-9 I	D-8	D-7 I	D-9	D-8	D-7	D-9	D-8	D-7	D-9	D-8	D-7	D-9	D-8	D-7
Link	≯	102	48	40	06	75	50	50 140	105	833	:	:	:	:	:	:	:	390 Nos. Elec. Rods 5MM	259 Nos. Elec. Rods-
	īτ'	214	24	84	110	135	80	140	105	83	:	:	:	:	:	:	:	:	:
Grousers	*	192	133	112	84	5	33 1	1400 Nt	1400 1310 1200 ——Numbers		ft. Fr. Flec. rods 5MM	2050 fr. Flec. rods 4MM	:	8.5	8.5 cach—	8.5	:	:	:
	Щ	:	:	•	:	:	:	:	:	:	:	:	:		8.5	8.5	:	:	:
Carrier Rollers	≱	∞	\$	4	115	85	55	:	:	:	6	4	:	:	cacu	:	:	:	:
	Ľ٠	7.	œ	9	115	88	55	:	:	:	9	m	:	:	:	:	:	:	:
Rollers	×	89	45	33	:	:	:	35	72	71	80	40	:	8.1	8.1 cach	». 	:	04	23

7	4	‡	90	£	:	:	:		55 2/ 21 00 30	77	3	20	:	×.1 ×.1	٠٠. ناري:	. v	:	OI CI	2	
A Sprockets	≱	v	4	m	:	:	:	720 N	720 660 540 1150 575	240	1150 ft.	575 ft.	:	2	10 each	5 10 10 10 ==========================	:	150 110 Nos. Rods.	110 Rods.	
&PC/NI											Ele. Rods 4MM	Elec. s Rods.								
75 75	ц	:	:	:	:	:	:	:	:	:	:	:	:	10 10 10	10	10	:	:	:	
Idlers	≱	40	30	24	35	25	18	27	27	20	50	45	:	10.8 10.8 10.8	10.8	10.8	:	30	70	
	μ	70		50 40	35	35 25 18	24	27	27	20	36	33	:	10.8 10.8 10.8	10.8	8.01	;	10	7	
W-stands for Welding Rods.	4	F-stands for	Weldin	for Welding Flux.																

MAX WEAR LIMITS OF TRACK COMPONENTS IN MILLIMETER

				Lar	Larsen Toub)FO	यमे	Trac	tors In	dia		Beas		Ż	N.M.D.C.		Rajast	Rajasthan Canal	72
!			i	D-9 D-8	D-8	D-7	व ज	D-9	D-8	D-7	D-9	D-8	D-7	D-9	D-8	D-7	D-9	D-8	D-7
Link .				10	10	10	यने	10	10	10	03	2	10	15	15	15	:	6	6
Rollers (dia)				18.7	21.3	10.1		10	10	10	20	20	20	9	9	9	:	19	19
Idlers (dia)				19.0	19.0	20.0		10	10	10	10	10	10	9	9	9	:	9.25	6
Sprockets .			•	on knife edge.	edge.			10	10	01	10	10	10	15	15	15	:	œ	9
Grousers bar height .	height			25	25	25		:	:	:	:	:	:	:	:	:	:	45	39

ESTIMATE AVERAGE WORKING HOURS FOR WHICH REBUILT TRACK COMPONENTS LAST IN SERVICE

⁽²⁾ Fractor India:— 70% to 80% of the wo (3) Beas:— 1000—2000 hours. (4) N.M.D.C.:— 1500—2000 hours. (5) Rajasthan Canal:—1500—2000 hours. (6) Neyveli:— 3500—4000 hours.

TYRE LIFE

Name of I	Proje	ect					Machine on which tyre is used	New life in hours	Retreaded life in hours
N.M.D.C.					•		Rear Dumpers	1400	900
Kiriburu			•		٠		Haul-Pack	900	500
N.C.D.C.		•	•				Dumpers	1800—2000	1800
Ramganga		•		•		٠	Scrapers Rear Dumpers Bottom Dumper Loader Grader Dozer	2000 3000 1500—2000 1500 2000 1800	
Beas •	•	٠	•	•	•		33·5 x 33—32PR 37·5 x 33—36 37·5 x 33—42 33·5 x 39—38	2500—3000 2500—3000 1500—2000 2500—3000	
Ukai		•	,	•	٠	•	WABCO Dumpers & Scrapers	2000	
H.S.L. Kourke Barsua Mines	ua						Dumpers	18002000	
Rajhara Mines	i					•	Dumpers Belaz	15000—20000 KM	10,000 KM
Noamandi Mii	nes	•					Mack Dumpers	3000—4000 hours	3000 hours
Neyveli ·	•	•	•	•	•	•	Cat. Dumpers Haul-pak	5000 hours 4000 hours	
R.C.P.	•						Towed Scrapers	8000 hours	

APPENDIX 9. 1

Name of the State Project	Rate of Depre- ciation	Interest Charges	Major and Field repair charges	Operation & Supervision charges	Departmental Charges	Remarks
	2	3	4	80	9	7
1. Andlıra Pradesh						
Chief Engineer, N.S. Dam	S. C per hour	5% per annum on capital cost (leviable from contractors only)	100% of aepreciation	100% of aepreciation Certain fixed charges	Not indicated	For machinery hired on daily basis, 8 working hours will be reckoned as a day. The Calendar day is from 12 midnight to 12 midnight. For levy of charges, 4 hours or less will be reckoned as half a day and more than 4 hours to 8 day and more than 4 hours to 8
•			स्यमेव जयन			pround as full day. In case of machines, the actual hours of working may be charged at the discretion of Executive Engineer. In a calendar day any extra charges over and above those included in the hire charges, incurred for crew for intermittant work should be recovered from the Contractor. The minimum charges during the month shall not be less than the charges for 20 days.
2. Badarpur Thermal Power Station	Nor hour	6% on the Capital Cost per annum	100% of depreciation in the case of tractors & 60% of depreciation in the case of Crawler & tyred Cranes.	As per actuals plus 25% 1 of Labour charges for Citie hours	12½% of the total of Columns 2 to 5.	Daily rate as charged by assuming 6 hours of working in 8 hours shift.
3. Gujarat State	C per hour	6% on Capital cost	Major repairs 120% of depreciation. Maintenance and Field repairs 25% of Major repairs.	P.O.L. & Crew charges as per actuals,. Supervision charges 10% of depreciation and Major repairs.	10% of depreciation	1. While calculating the interest charges schedule working hours are to be taken as 2500 & 1250 on two shifts & one shift basis respectively.
						 Principles for calculating the rates for Idle hours— Dep. 4 of the normal depreciation. Wages of operating crew.

7	(iii) Overhead;—10% of Normal depreciation. (iv) Interest;—As in case of working hours rate. 3. In case the equipment is idle on account of the contractor for full or part time of the shift the hire charges will be as per 2 above plus 10% extra.		Class A Equipment	Plant and Machinery likely to have a life of 20 years.	Class B Equipment Plant and Machinery likely to have a life of 12 years.	Class C Equipment 6 years life span.	The charges are for Class I, item of equipment which comprise of heavy earthmoving machinery:—For other class of equipment (without prime movet as an integral part) 3.2% of capital cost per month on single shift working which include depreciation, tyre replacement and supervision charges.
9		ded ers on or or or or or or or or or or or or or				pes:	s 10% of Cols. 2, 4 & 5.
'n		Operational charges:— Ta) Wages at actuals. (b) Fuel as recomment by the manufactur or as calculated the basis of Ho Power. (c) Lubricants etc. at 2 of the cost of fo Overhead:— As usual practice in project.				4% per annum 10% per annum (The percentage will be based on the original cost or the appraised value where the cost is not known).	P.O.L. and Crew charges as per actuals.
4		100% of depreciation	नयने	າ 10% per annum	n 10% per annum	10% per annum ge will be based on the cost is not known).	120 to 150% of den n preciation.
3		1 Not indicated		4% per annum	4% per annum	4% per annun (The percenta value where th	6% of Capital cost per annum
2		ir C per hour Aec. N	Soard and rigation	5% per annum	$8rac{1}{2}\%$ per annum	16½% per annum	C per hour
		4. Janunu & Kashmir Chief Engineer, Mechanical and Stores Deptt. Janmu.	5. Kerala State State Electricity Board and Chief Engineer Irrigation	Class A Equipment. 5% per annum	Class B Equipment	Class C Equipment	6. Meharashra

			125	
7	Assumption made on working of equipment: at 8 hours/shift. 25 days/month and 10 months/year.	(i) No separate provision is made for Field Repairs.(ii) For idle period, ‡ of hire charges are levied.	(i) Rule 2.21:— NOTE:—When any plant or machinery belonging to an Irrigation Branch Division is lent for use in another Irrigation Branch Division, working under a different unit, a hire charge of 16% per annum on the original purchase price of the plant should be charged. The period for which the hire charge is to be levied in such cases should be that for which the plant is actually in use in borrowing Division. No hire charges should be tevied for the period the plant remains idle in the borrowing Division.	(ii) Rules 4·16:— Note:—When tools and plant belonging to the Irrigation Branch are lent outside the Department, a hire charge of 5% per mensem on the original purchase price of the plant should be levied for the entire period the plant is away from the Irrigation Branch Division concerned.
9			:	
5	Cost of fuel, Inbricants, grease, cotton waste etc. as per Issue rate on market rate whichever is Wages as per actuals plus 50% of wages towards leave, idle period and retrenchment and other benefits.	P.O.L. and Crew charges are to be paid by the party hiring equipment as per actuals.		
4	Major Repairs different for different machines. Field Repair 30% to 50% of Capital cost.	100% of depreciation cost.	सयमेव जयते	
3	5% per annum on capital cost.	Not levied	;	
2	C per hour	C per hour	:	
1	7. Mysore Superintending Engineer Central Mechanical Organisation, Dharwar.	8. Orissa State Mechanical Circle, Hirakud.	9. Punjab State Punjab Departmental Financial Rules.	

	In addition to the above hire charges the borrowing department must pay carriage on the plant both ways and be responsible for the cost of running repairs as distinct from special overhaul. The cost of special overhaul should be borne by the Irrigation Branch Division to which the Plant or Machinery belongs.	The rate of hire charges shall be fixed on the basis of hourly rate worked out taking into account both Direct & Indirect charges viz. wages of operators, helpers, depreciation charges. Supervision	charges & major overhaul fund repairs & renewals on account of fair, wear & tear & interest on capital cost etc. The machines shall be lent out on hire for a period not exceeding 3 months.			
9		Departmental charges Establishment ctarges. 14.5% T&P charges. 1.5% Audit and Account charges. 1.0% Pensionary charges.	0.94%, 17.94% of the total hire charges.			
S		As per actuals (10% of operational charges as supervision charges extra for contractors).		Fuel and Lubricants at actuals. Cost of Jabour at actuals plus 25% of the Jabour cost to cover incidentals like-wages paid during non working scason etc.	(i) The cost of labour to carry out the repairs and General charges levied by the Workshop is covered by the percentage provided for repairs. No separate Supervision charges are accounted for.	(ii) P.O.L. & Crew charges as per actuals.
4		Different for different machines.	स्यामेन जयते	Major repairs 75% of depreciation. Field repairs 25% of depreciation.	Major repairs 50% of depreciation and Minor repairs 35% of depreciation.	
3		6% per annum on Capital cost.		6% per annum on Capital cost.	It is subject to levy of interest till the cost is repair; interest charges not worked out.	
2		. C per hour		C per hour	0.95C	
		10. Rajasthan State Rajasthan Canal Pro- ject, Suratgarh.	11. Tamihudu State	(i) Chief Engineer Irrigation, Che- pauk.	(ii) Parambikulam Aliyar Project	

-	2	3	4	5	6	
12. Uttar Pradesh (a) Superintending Engineer, Central Equipment and Store, Lucknow (Obra Dan)	C — per hour	Not included.	Major repairs at 100% of depreciation & minor repairs at 49% of depreciation.	As per fuel consumption formula. Labour charges as per actuals plus 50% extra for non-working season.		
(b) Tons civil Construction Circle (UP)	0.9 C N per hour.	Not included.	Major repairs at 70% to 100% of cost of cquipment & repairs and maintenance 40% of cost of equipment.	(i) 10% of operational charges supervision charges given on hire to contractor. (ii) P.O.L. as per fuel consumption formula. Crew charges as per actuals.	5% extra of the total towatds idle charges.	, var ds
(c) Gandak Canal Construction Circle(UP)	1.1C	Not included	Major repairs at 72 %. Minor repair at 30 %, of depreciation.	P.O.L. and labour charges as per actuals.	Departmental charges 10% of Major repairs charges.	
(d) Ramganga Project (UP)	0.9C per hour N	61% of the average annual investment.	Major repairs at 100% Minor repairs at 40% of deprecintion. Sundries-5% minor repairs.	P.O.L. & labour charges as per actuals. Overhead charges @10% of total hire charges.		
13. West Bengal Chief Engineer, Fara- kka Bartage.	0.9C N per hour	6% on the average Annual investment per annum.	130% of deprecia-	As per actuals.	2% of depreciation.	
14. H.S.L. Bhilai.	C per hour N	10% on average Annual invest- ment.	50% of depreciation for Stationary equipment. 80% of depreciation for Wheeld equipment. 100% of depreciation for Crawler equipment.	As per actuals.	17½% of the totals of columns 2 to 6.	

Note:—C=Capital Cost of the Machine.
N—Schedule life in hours.

 ${}_{\text{Appendix 9.2}}$ Statement showing the life of equipment and the estimated ownership cost

	Equipment	Life in Yrs.	Annual O	wnership C Eqpt.	ost as a %	of cost of	Hours used per year	Hourly ownership cost on
		Life in Hrs.	- Depreciation	Repair Cost	Interest at 6%	Total	jeat	yearly basis as a factor of Eqpt. cost.
	1	2	3	4	5	6	7	8
1.	EXCAVATORS							
	(i) Upto 21 Cyds. Diesel .	. 5	20	12	3.6	35.6	2,000	0.0178
		10,000	 1					
	(ii) 2½ to 4 Cyds. Diesel	. 8	12.5	9	3.4	24.9	2,000	0.01245
		16,000						
	(iii) $2\frac{1}{2}$ to 4 Cyds. Elect	. 10	10	8	3.3	21.3	2,000	0.01065
		20,000	CTPREST.					
	(iv) Above 4 Cyds. Elect	. 12	8	6	3.2	17.2	2,000	0.0086
		24,000						
2	DUMPERS	1				• • •	- 000	0.0100
۷.	DOMPERS	. 5	- V. (II. 1777)	16	3.6	39.6	2,000	0.0198
		10,000	THE	1. Ja				
3.	SCRAPERS	- {		(Z)	•			
	Motorised	. 5	20	20	3.6	43.6	2,000	0.0218
		10,000	सत्यमव ज	यन				
4.	TRACTORS					,		
	A. Below 50H.P.							
	(i) Crawler	. 4	25	25	3.75	53.75	2,000	0.02688
		8,000	_					
	(ii) Wheeled	. 4	25	10	3.75	38.75	2 000	0.01938
		8,000	_					
	B. Above 50 H.P.							
	(i) Crawler	. 5	20	30	3.6	53.6	2,000	0.0268
		10,000	_		•			
	(ii) Wheeled	, 5		12	3.6	35.6	2,000	0.0178
		10,000	•				·	
5	GRADERS	.	30	10	2 6	25 6	2,000	0.0178
٠.	GRAPERS	10,000	_	12	3.6	35.6	4,000	0.0176

	1	2	3	4	5	6	7	8
6.	LOADERS							
	(i) Wheeled	5	20	12	3.6	35.6	2,000	0.0178
		10,000						
	(ii) Cralwer	. 5	20	30	3.6	53.6	2,000	0.0268
		10,000						
7.	CRANES							
	(i) Crawlers upto 15T at 10' rad.	. 5	20	10	3.6	33.6	16,000	0.021
		8,000						
	Upto 40T at 15' rad	. 8	12.5	7.5	3.4	23.4	1,200	0.018
		10,000						
	(ii) Truck Mounted	. 5	20	10	3.6	33.6	1,600	0.021
		8,000						
8.	ROLLERS							
	(i) Sheepfoot (towed)	4	25	5	3.75	33.75	1,500	0.022
		6,000		3				
	(ii) High Speed Compactors .	. 5	20	12	3.6	35.6	2,000	0.017
		10,000	Ten III					
	(iii) Smooth drum	. 7	15	10	3.5	28.5	2,000	0.014
		14,000		Å.				
9.	COMPRESSORS	licht.		1				
	(i) Portable upto 300 cfm.	. 4 ^된	यमेव नुपते 25	10	3.75	38.75	1,200	0.0323
	•	5,000					·	
	(ii) Above 300 cfm	. 5	20	8	3.6	31.6	1,200	0.025
		6,000						
0.	DRILLS							
	(i) Jack-hammers	. 3	33	. 5	4	42	1,200	0.03
		3,600						
	(ii) Wagon drills	. 7	15	10	3.5	28.5	1,400	0.020
		10,000						
1.	CONCRETE MIXERS	. 4	25	10	3.75	38.75	1,500	0.0255
		6,000						

Note.— 1. Repair cost as indicated is for average conditions.

^{2.} Repair cost includes escalation and obsolesence of factor of spare parts required for the repairs.

^{3.} Replacement of tyres is not included in the repair cost of Pneumatic tyred equipment. If the operation charges are to be borne by the contractor and this is required to be charged then the repair charges of Pneumatic tyred equipment may be increased by 10 to 15% of the cost, by calculating the element of tyre cost from the equation given at para 9.6.5.2 of this chapter.

¹⁸⁻⁻⁴ CW & PC/ND/75

APPENDIX 9.3.1.

DAILY REPORT OF THE OPERATION OF EQUIPMENT GIVEN ON HIRE

	Cost	Man-hours spent on repairs	Cost	Other mat- erial or work done repairs	Cost	
		Shift	•••••	••••••		
•		Date				
T OF REPAIRS CARRIED	OUT TO T		NT GIVEN	ON HIRE		
ets noted during operation	(Circle)	3			2	
		—Lit				
		Lubricants-Lits	3.			
L. issued		Diesel-Lits.				
of hrs. worked						
		Where Used				
		Shift		• • • • • •		
	of hrs. worked	of hrs. worked	Where Used	Shift		Where Used

DAILY MAINTENANCE REPORT

Equipment Code No.	Date	•••••
Name of Lessee.	Shift	
Detail of maintenance done during the day.		

Details of adjustment done during the day.

Daily 50 hrs. 100 hrs. 500 hrs. 1000 hrs.

Engine Transmission Clutch Final Drive Under Carriage Body Other parts.



Report on Performance of different components of equipment.

Indicate measurements when wear limits are to be checked.

Engine Transmission Clutch F.D. Under Carriage Body Other parts.

PREVENTIVE MAINTENANCE

I—DAILY SCHEDULE FOR I.H. 100 PAYHAULERS

	PAYHAULER NO TOTAL PROGRESSIVE HOURS									
Description	Tick	Remarks, if any								
STAGE-I		-								
(a) Wash										
(b) Clean the glass surfaces (windshield and instruments)										
STAGE-II										
(a) Fill water in radiator, check leaks and correct										
(b) Check engine oil level, add (Delvac 1330) if necessary										
(c) Check engine oil leaks and correct										
(d) Check the fluid level in the brake power cluster front and rear after cleaning the area around the filler cap. (Hydraulic Brake fluid)	,									
(e) Check the transmission oil										
(f) Check the hydraulic reservoir										
(g) Clean air cleaner pan										
(h) Bleed air tank		1								
(i) Inspect the tyres for damage inflate pressure front 50 lbs./Sq. In rear 70 lbs./Sq.										
In.										
STAGE-III Grease the following parts (MPG)										
(a) Drag link (front)										
(b) Drag link (rear)										
(c) Steering cylinder anchorer										
(d) Steering cylinder end										
(e) King pins										
(f) Tie rods										
(g) Hoist cylinder bearings										
STAGE-JV										
(a) Drain fuel tank sump cock										
(b) Drain fuel filter sump	•									
(c) Fill fuel in the tank										
Special remarks, if any:	•									
Quantity of fuel used Other materials used Nan Lubricants used	ne of Mechani	c								
1.										
2. Signature	ð									
3. Signature	of GF/Forem	ıan/C-man								
	of the Inspec									

II. 100 HRS. SCHEDULE FOR I.H.-100 PAYHAULERS

DAT	E			P	AYHA	AULE	R NO)		
		TOTAL PROGRESSIVE HO) UR	S						
Sta	ge	Description							Tick	Remarks, if any
1	(a)	Wash · · · · · · · · ·				٠				
		Clean the Glass surfaces (Wind Shields and instr	rume	nts)	•	•	•			
11	(a)	Fill water in radiator, check leaks and correct				•		.		
	(b)	Check Engine Oil leaks and correct · ·			•	•		.		
	(c)	Drain and refil Engine Oil (Delvac 1330)			•			-		
	(d)	Clean Crank case breather · · ·	•		•			.		
	(e)	Check the fluid level in the brake power cluster f area around the filler cap. (Hydraulic Brake Flu		and r	ear aft •	er cle	aning	the		
	(f)	Check Transmission Oil level with engine idling oil Right Type Cl.	, add	l if ne	essary	/ Mot	ile D	TE		
	(g)	Clean Transmission breather and reoil .	•	•	•	٠	•	.		
	(h)	Check Hydraulic tank oil level, add if necessary Mobile DTE oil	and	clean	hydra	ulic b	reathe	er .		
	(i)	Clean Air cleaner pan · · · ·			ES.	•	•	-		
	(j)	Bleed Air Tank · · · · ·			37	٠	•			
	(k)	Check oil level in Differential · · ·			3	•	•	.		
	(l)	Check oil level in Drive Axle · · ·	PAR			•	•			
	(m)	Check oil level in planetary reservoir	VV	448		-	•	.		
	(n)	Check breather tube	41	GPW ?	à.		•	.		
	(o)	Clean steering booster Breather			3			.		
	(p)	Drain compressor oil and change	1		w.		•	.		
	(q)	Change lub. oil filter after every 200 hrs.	मेव	जयते						
	(r)	Change transmission oil filter after every 250 ho	urs		•		•			
Ш	(a)	Drain fuel tank sump Cock · · ·	•	•	•			.		
	(b)	Drain fuel filter sump · · · ·	•	•	•		•	.		
	(c)	Fill fuel in the tank · · · ·	•	•	•	•	•			
iV	GR	EASE THE FOLLOWING POINTS (MPG)								
	(a)	Drag link front · · · · ·	•	•	•	•	•	.		
		Radius Rod front · · · · ·				•				
		Drive line front · · · · ·						.		

(d) Steering Cylinder anchorer(e) Steering Cylinder end ·

(k) Hoist cylinder bearings .

(f) King pins
(g) Tie rods
(h) Drag link rear
(i) Radious rod (rear)
(j) Drive line (rear)

St	age	Description	Tick	Remarks, if any
v	OI	L CAN POINTS (Delvac 1330)		
	(a)	Hinge pin & Spring case		
	(b)	Transmission shift linkage		
	(c)	Hood and Battery Box fasteners		
	(d)	Wind shield wiper motor		
	(e)	Throttle linkage	ļ	
	(f)	Hoist control linkage	! 	
	(g)	Emergency brake linkage		
VΙ	(a)	Check the Electrolyte in Battery, add distilled water if necessary · · ·		
	(b)	Check, clean and tighten battery terminals of bracket · · · · ·		
	(c)	Check and oil generator and self starter · · · · · · · ·		
	(b)	Check lights and switches, Correct, if necessary		
	(e)	Check and clean Generator & self starter carbon brushes, commutator		
	(f)	Check and adjust generator belt tension, replace if necessary · · ·		
	(g)	Check and adjust fan belt replace if necessary · · · · · ·		
	(h)	Check air pressure, water temp. & oil pressure gauges	1	
VII	CL	EAN ENGINE AIR CLEANER		
		Clean Dust cap	}	
	(b)	Inspect tubes and clean with brush	}	
	(c)	Use new scal ring	}	
	(d)	Service Filter element replace if damaged or in doubt	}	
	(e)	Check hoses, gaskets for Cracks/leaks rectify	ļ	
7111	(a)	Remove mud and dirt accumulation in brake drum	}	
	(b)	Tighten the wheel rim clamp nuts	Ì	
	(c)	Inspect the tyres for damage pressure front 50 lbs. Rear 70 lbs.		

Special remarks, if any:-

Quantity of Fuel used Lubricants used	Other Materials used	Name of Mechanic
1		Signature
1	•••••••••	Sig. of GF/Foreman/C-Man
2	***************************************	3.6. 3. 2.1. 3.3. 3.4.
3		
4		•••••
		Signature of Inspecting Officer

PREVENTIVE MAINTENANCE

III—I.H.—100 PAYHAULER 500 HRS. SCHEDULE

DATE	PAYHAULER NO
	TOTAL PROGRESSIVE HOURS

Description	Tick	Remarks, if any
STAGE-I		
(a) Wash		
(b) Clean the Glass surface (Wind shield & Instruments)	-	
STAGE-II		
(a) Fill water in Radiator, check leak and correct		
(b) Check engine oil leaks and correct	.	
(c) Drain and refill engine oil (Delvac 1330)	.	
(d) Clean crankcase breather		
(e) Check the fluid level in brake power cluster front and rear after cleaning the are around the filler cap (Hydraulic Brake Fluid)	a ·	
(f) Change the oil in transmission (Mobile DTE oil Light type C1)	.	
(g) Clean transmission breather and reoil	.	
(h) Check hydraulic tankoil level, add if necessary and clean hydraulic breather (Mobile DTE oil)		
(i) Remove the complete Air cleaner & Clean · · · · · · · ·		
(j) Bleed Air tank · · · · · · · · · · · · · · · · · · ·	•	
(k) Drain Compressor oil and change		
(1) Clean the compressor housing and impeller of turbo-charger · · ·	•	
(m) Check oil level in differential	•	
(n) Check oil level in drive axle	•	
(o) Check oil level in planetary reservoir	•	
(p) Check differential breather tube · · · · · · · · · · ·	•	
(q) Clean steering booster breather · · · · · · · · · · ·	•	
(r) Change lube, oil filter after every 200 hours.	•	
(s) Change transmission oil filter after every 250 hrs. · · · · ·	-	
STAGE-III		
(a) Drain fuel tank sump cock	•	
(b) Drain fuel filter sump · · · · · · · · · · · · · · · · · · ·	•	
(c) Fill fuel in the tank · · · · · · · · · · ·	•	
STAGE IV-GREASE THE FOLLOWING POINTS (MPG)		
(a) Drag link (front)		
(b) Radius rod (front)		
(c) Drive line (front)		
(d) Steering cylinder anchoror · · · · · · · · · · · · · · · · · ·	•	
(e) Steering cylinder end · · · · · · · · · · · · · · · · · · ·		
(f) King pins		

Description	Tick	Remarks, if an
(g) Tie Rods · · · · · · · · · · · · · · · · · · ·	•	
(h) Drag Link (rear) · · · · · · · · · · · · · · · · · · ·	•	
(i) Radius rod (rear) · · · · · · · · · · · · · · · · · · ·	•	
(j) Drive line (rear) · · · · · · · · · · · · · · · · · · ·	•	
(k) Hoist cylinder bearing · · · · · · · · · · · · · · · · · · ·	•	
(I) Lubricate the engine transmission · · · · · · · · · · · · · · · · · · ·	-	
TAGE-V		
DIL CAN POINTS (DELVAC 1330)		
(a) Hinge pin and spring case · · · · · · · · · · · · · · · · · · ·	•	
(b) Transmission shift linkage · · · · · · · · · · · · · · · · · · ·	•	
(c) Hood & Battery box fasteners · · · · · · · · · · · · · · · · · · ·	•	
(d) Wind shield wiper motor · · · · · · · · · · · ·	•	
(e) Throttle linkage · · · · · · · · · · · · · · · · · · ·	•	i
(f) Hoist control linkage	•	
(g) Emergency brake linkage · · · · · · · · · · · · · · · · · · ·	•	
(h) Door hinges · · · · · · · · · · · · · · · · · · ·	•	
(i) Door striker plates and latches	•	
STAGE-VI		
(a) Check the electrolyte in Battery, add distilled water if necessary	.	
(b) Check clean and tighten battery terminals and bracket	`	
(c) Check lights and switches, correct if necessary	.	
(d) Check generator and self starter. Lubricate with oil can (Delvac 1330)	•	
(e) Check and clean Generator and self starter carbon brushes, commutator ·	•	
(f) Check and adjust generator belt tension, replace if necessary · · ·	•	
(g) Check and adjust fan belt, replace if necessary	•	
(h) Check air pressure, water temp. and oil pressure gauges · · · ·	•	
STAGE-VII		
CLEAN ENGINE AIR CLEANER		}
(a) Clean dust cap · · · · · · · · · · · · · · · · · · ·	•	
(b) Inspect tubes and clean with brush	•	
(c) Use new seal ring	.	
(d) Service filter Element, replace if damaged or in doubt	.	j
(e) Check hoses, gaskets for leaks/cracks and rectify	.	
STAGE-VIII		
(a) Remove mud and dirt accumulation in brake drum	.	
(b) Tighten the wheel rim clamp	•	Ì
(c) Inspect the tyres for damages. Inflate pressure front 50 lbs./Sq. In. Rear 70 lbs. Sq. In.	s.	
(d) Check the torques of front axle and drive axle spring bolts (front axle 'U' Bolts Nuts 450 to 500 ft. Lbs.) Drive axle 800 to 900 ft. Lbs.)	•	
STAGE-IX		
(a) Adjust the valves and injector · · · · · · · ·		

Quantity of Fuel/Lubricants used	Other materials used	Name of Mechanic
1		Sig
2		Sig. of GF/Foreman/C-Man
3	•••••	
4		
		Signature of Inspecting
		Officer
		Appendix 10·2
	HISTORY BOOK	·
	Instort book	
1. History Card.		
Equipment Code No. · · ·	· Purchase refe	
Description · · · ·	· Supplier's na	
*Capacity · · · · ·	· Condition wh	nen purchased · · · New/Old
Shipping Wt. · · ·	· If old, hours	worked when purchased \cdot
Overall dimensions:	Purchase Pric	œ:
Length · · · ·	• • • • • • • • • • • • • • • • • • • •	
Width · · · ·	· · C.I.F.	
Height · · · ·	· · · Customs dut	y · · · · ·
Wheel base · · ·	· · · Taxes	
Turning radius · ·	· · · Freight & Ha	andling· • • • •
Ground clearance · ·	· · Total ·	
	Years Hours Weight d	listribution
Equipment life · · ·	·	Empty Loaded
Tyre life · · · ·	· Front ·	· · · · · · · · · · · · · · · · · · ·
	Drive ·	· · · · · ·
	77	

^{*} Capacities may be indicated as Bucket Capacity, lifting capacity, carrying capacity, drawbar Pull etc. 19—4 CW & PC/ND/75

Details of Components:-

2014113 0) 007	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,														
Engine	Moto	r			In	iecto	rs				Con	npres	sors		
Make ·	•	•	•		Type	•	•	٠	• • • • • • • • •	Тур	oe ·	•	•	•	
Model ·	•	•	•	••••••		•	•	٠		Ma	ke ·	•	•	•	• • • • • • • • • •
Sl. No.	•	•	•	•••••		•	•	•	• • • • • • • • • • • • • • • • • • • •	SI.	No.	•		•	•••••
No. of Cylind	ers	•	•		Pressure	٠	•	•	• • • • • • • • • • • • • • • • • • • •	Pre	ssure	•	٠	•	
Cycles •					Start	ing	Syster	n			Dynan	10/Al	ternal	ors	
R.P.M.		•			Type ·		•			Ma	ke •				
H. P. /K. W.					Make ·				•••••	Sl.					
Max. Torque/	Volts	•			Model.				•••••	K .	W.				
Compression 1	Ratio	•			Sl. No.										
Super C	harge.	r/Turh	o (Charger	Generato	or ()	Main)				Other N	fator	•		
Make			•			, (.	•			Ma					
Model .					Sl. No.		•			Тур					
Sl. No.				•••••	K. W.		•								
Battery					Volts		•				./K.W.				
Nos.	•				Suspension	-	100				que/Vo		-		
Size ·					Type ·	115		B	₿		trol Ty			,	••••••
Make •					Fuel Pump				***************************************	ÇUII	v. 1 y _[ρE			
Volts ·					Type ·	63	1/8	1/	J						
Amp. Hour					Make •	V				Trai	nsmissio	n			
					27	di	MA	9	2	•••		•			
Hydraulic Pum	p				Sl. No.	ŢŲ.		12		Тур	e ·	•	•	•	• • • • • • • • • • • • • • • • • • • •
Make ·	•	•	٠	•••••	Steering	dine			all a	Mak	ce	•	•	•	•••••
SI. No.	• •	•	٠	•••••	Type ·	स	प्रमेव व	14-		Mod	lel	•	•	•	•••••
Brakes					Specification	n of	Grease			Sl. 1	No.	•	•	•	
Type		•	•	••••	1 .	•	•	•	•••••	No.	of spee	ds			
					2 .	•	•	•		I	Forward	1	•	•	
Tracks										F	Reverse			•	
No. of shoes	•	•			3 .		•			Max	. travel	spee	d		
Length ·	•		•		Liquid Capa	citle.	s & Spe	eci-		F	orward	l			
					fication					1		•	•	•	
Width •	•	٠	•	•••••	Cooling syst	em	•	•	• • • • • • • • • • • • • • • • • • • •	2	•	•	•	•	
					Fuel tank	•	•	•		3	•	•	•	•	•••••
Ground contact	•	•	•	• • • • • • • • • • • • • • • • • • • •	Engine Cran	k	•	•		4	•	•	•	•	•••••
V6P "					Case					5	•	•	•	•	•••••
No. of Rollers Track	•	•	•		Starting Eng		•	•	ů.	Th.					
					Crank Case		•	•		K	everse				
					Transmission	1	•	•	• • • • • • • • • • • • • • • • • • • •						
Carrier	•	•	•		Final drive		•	•	• • • • • • • •	1	•	•	•	•	

81. N o.	Description	Quantity	Availa	ble at	Remarks
2. Deta	ails of Accessories, Tools and I	Literature received with	the equipment		
*Capacities	may be indicated as Bucket C	apacity, lifting capacit	y, carrying capacity	, drawbar P	ull etc.
		Others			
		Hydraulic			
ressure		Transmission		4.	•••••
/lake		Lub.		3.	•••••
Aos.		Fuel		2.	
lize		Air		1.	
Гуре .		Filters Type & Nos.		•	Specification size & length
res		Hydraulic tank •	•	3 .	• • • • • • • • • • • • • • • • • • • •

Date of	\$2.115.50	9			
Arrival	Hrs. done before arrival	Condition	Date of Transfer	Hrs. done upto the date of Transfer	Condition
2	15 3 12	4	5	6	7
		arrival	arrival	arrival	arrival date of Transfer

सद्यमेव जयते

4.	4. Details of Alteration Modification										
Date	Hour-meter reading/ Clock-hours done	Details of Modifications/ Alterations carried out	Details of Spare Parts/ Materials used	Job Cost	Remarks						
1	2	3	4	5	6						

- 5. Details of Spare parts consumed component-wise
- * (a) Engine (b) Transmission (c) Clutch (d) F.D. & U.C. (e) Attachments and other components

Date	Hour meter or Clock meter reading	Details_of spare parts used	Quantity	Cost
t	2	3	4	5

* Separate sheets should be maintained for each component.

6. Details of Assemblies Replaced

Date	Hr. Meter/Clock hour reading	Assembly replaced	Sl. No. & Part No.	Old Assembly discarded or sent for repairs	Date/hr. meter reading when old Assembly is returned for replacement	Remarks
1	2	3	4	5	6	7

7. Details of Repairs | Replacements carried out to different components and cost of repairs

* (a) Engine (b) Transmission (c) Clutch (d) Final Drive (e) Under Carriage (f) Attachments and/or other components

Date	Mfr's Sl. No. of Unit installed	il. No. of Working hrs. of unit removed or repaired				airs	Total	Removed unit	
	Out instance		S	Spare parts	Labour	Other materials	Workshop Overhead	. majaba	if not reinstalled retd. to
1	2	3	4	5	6	7	8	9	10

8 a. Tyres & Tubes |

Date of installation/replacement	Tyre position	Tyre No.	Make	Type & PR	Condition Retreaded/ Repaired/ New/Old	Hours worked by repaired tyre	Cost of repairs/ replacement	Reasons
1	2	3	4	5	6	7	8	9

^{*}Separate sheet should be maintained for each component.

8	b.	Batteries

Date of replacement	Battery No.	Make	Specifica- tions	Condition New/recon- ditioned/ recharged	Reasons for replace- ment	Hours done	Cost of repairs or replacement	Remarks
1	2	3	4	5	6	7	8	9

Date of replacement/	Make	Hours done since	Cost	Time taken for	Remarks
installation	Marc	last replacement	Cost	replacement	Kemarks
1	2	3	4	5	6

Date of installation/ replacement	Make	Condition New Rebuilt	Reasons for replacement	Hrs. done before replacement	Cost of rebuild/ replacement	Remarks/ Observations about rate of wear etc.
1	2	3	4	5	6	7

9. Monthly Record of Hours Worked and Consumption analysis सन्धमेव जयत

Year.....

Month	Avail- able	Hrs. worked	Hrs.	Stand- by hrs.		onsumptio	on of		Nor-	Reasons		Re- marks	
	hours	WOIKCU	repairs	by ms.		uel	Lubri	cants	- mal/ abno- · rmal	for abnor-	taken	marks	
					Total	Per Hr.	Total	Per Hr.	· Imai	mality			
1	2	3	4	5	6	7	8	9	10	11	12	13	

10.	Yearly record	of	depreciation	and	repairs costs	!
-----	---------------	----	--------------	-----	---------------	---

Installed Cost.....

Rate of Depreciation.....

Life..... Years

			_			
Years	Hours worked	Amount of depreciation	Residual value	Repairs	Cost	Remarks
		doproducton		Spares	Labour	
1	2	3	4	5	6	7

Engine No. of Overhaul	1st. 2nd.	3rd.	4th.
Date of commencement	,		
Date of completion			
Clock hour/hour meter reading			
Condition of parts after overhaul	·		
Crank Shaft			
(i) Main			
(ii) Big end			
Pistons			
Rings			
Camshaft			
Head Cylinder			
Block Cylinder			
Fuel pump	250		
Injectors			
Turbocharger/Supercharger			
Compressor			
Radiator	YA 4784 E		
Lub. Oil Pump	CENTRAL PROPERTY.		
11 b. Track Components	Truits and		
	1st. 2nd.	3rd. 4tl	1
No. of Overhaul			
Date of commencement			
Date of completion			
Clock hour/hr. meter reading			
Condition of Parts			
Sprocket			
LH			
RH			
Idler			
LH			
RH			
Track Links		•	
LH RH			
Frack Rollers	A CONTRACTOR OF THE CONTRACTOR		
Carrier ,,			

Grouser Shoes

HISTORY BOOK

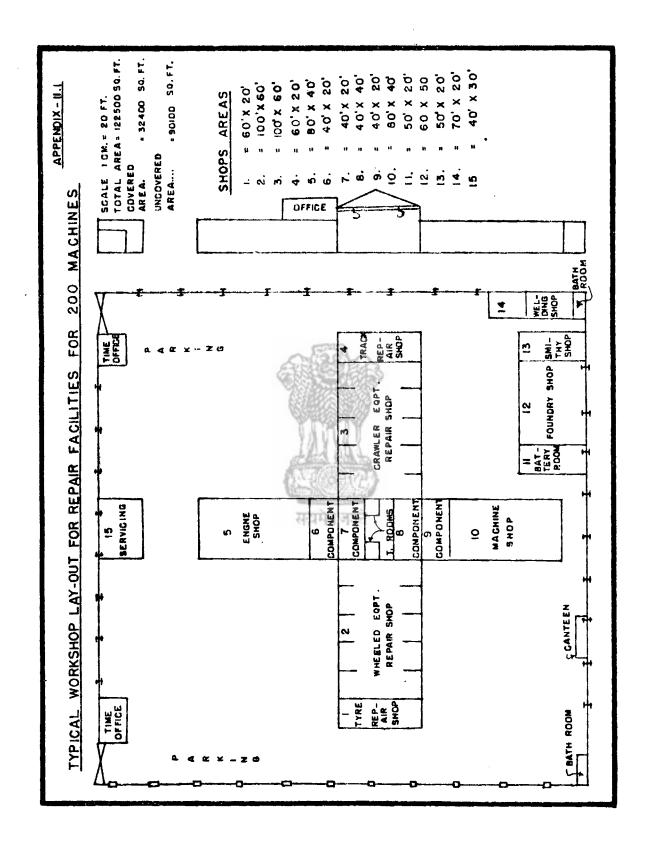
PREVENTIVE MAINTENANCE

Equipment Code No					Ch	eck Eve	ery mo	nth				
*Component - Under Carriage, Idler, S	procket	& Carr	ier Rol	lers								
Make										•	•	
Date of installation	Con	dition v	when in	stalled	New/	Rebuild	l/Old u	sed				
						Wear L	imits.					
	No. of checkings											
Hour Meter/Clock hour readings at the time of checking	1	st	2	nd	3	Brd	4	th	5	th	6	th
	LH	RH	LH	RH	LH	RH	LH	RH	LH	RH	LH	RH
No. of Readings												
1												
2												
3				······								
Observations												
Normal/Abnormal				200								
Recommendations		8			3							
		4			(II)			Officer	-in-Ch	arge P	M	
Action taken on Recommendation.		6			1			Onico	-m-en	alge I		
		Ĭ		MY						Forem	an	
*Separate sheet should be maintained for	r each co	mpone	ent of L	Inder (Carrias	re.						
		153		37	A	,						
		HIS	TORY	BOOF	<u> </u>							
	PRE	VENT	IVE M	AINT	ENAN	CE						
Emiliania de Asia						Che	ck Eve	ry mor	ıth			
Equipment Code No	• • •											
Equipment Code No* *Component — Under Carriage, Links, l		& Т	rack R	oller								
• •		. & Т	rack R	oller								
*Component — Under Carriage, Links, 1	Bushings				en inst	all e d N	lew/Re	build/C	old use	·d		
*Component — Under Carriage, Links, I	Bushings				en inst		•	build/C				
*Component — Under Carriage, Links, I	Bushings					Wea	r Limi	ts				
*Component — Under Carriage, Links, I	Bushings			on wh			r Limi	ts				 :
*Component — Under Carriage, Links, I Make Date of installation Hour Meter/Clock hour readings at the	Bushings		Conditi	on wh		Wea	r Limi	ngs				
*Component — Under Carriage, Links, I Make Date of installation Hour Meter/Clock hour readings at the	Bushings	st	Conditi 2r	on wh	3	Wea No. of	r Limir checki	ngs	51	th	61	h
*Component — Under Carriage, Links, I Make Date of installation Hour Meter/Clock hour readings at the time of checking No. of	Bushings	st	Conditi 2r	on wh	3	Wea No. of	r Limir checki	ngs	51	th	61	h
*Component — Under Carriage, Links, I Make	Bushings	st	Conditi 2r	on wh	3	Wea No. of	r Limir checki	ngs	51	th	61	h
*Component — Under Carriage, Links, I Make Date of installation Hour Meter/Clock hour readings at the time of checking No. of Readings 1	Bushings	st	Conditi 2r	on wh	3	Wea No. of	r Limir checki	ngs	51	th	61	h

							Wear	Limits		• • • • • •	
	No. of checkings										
Hour Meter/Clock hour readings at the time of checking	1st		2nd		3rd		4th		5th		6th
	LH	RH	LH	RH	LH	RH	RH	LH	LH	RH	RF
No. of Readings						_					
5											
6											
7											
Observations											
Normal/Abnormal											
Recommendations											
								Officer	-in-Char	ge P.M.	
Action taken on Recommendation.											

Foreman

*Separate sheet should maintain d for each component of Under Carriage.



APPENDIX 11.2

A SUGGESTED SPARE PARTS STORES FOR EARTH-MOVING EQUIPMENT

Value of Spare Parts

: From Rs. 12,00,000 to Rs. 15,00,000

Area .

: 2,400 to 3,0000 sq. ft.

Value of Spare Parts per sq. ft.

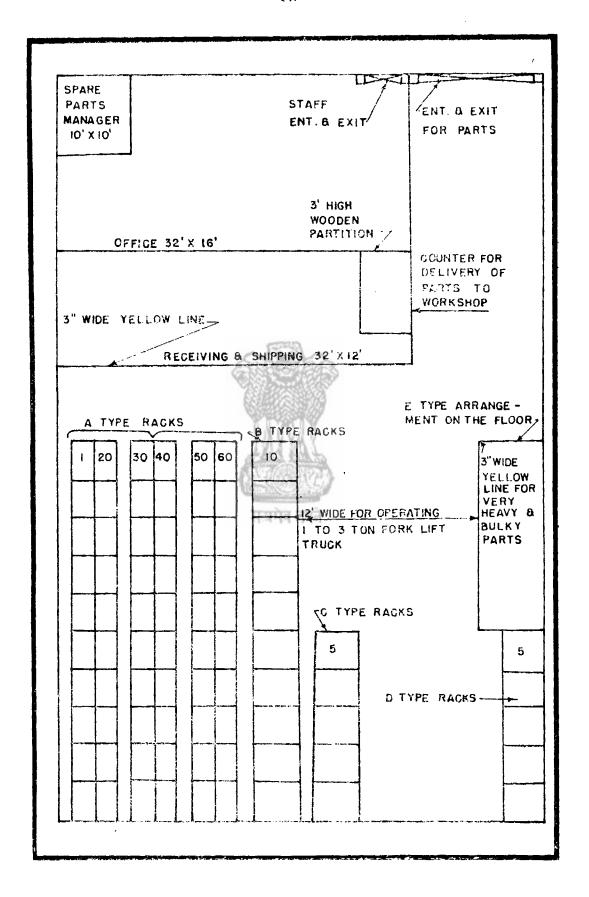
: Rs. 500.

S, No.	Types o	f par	ts a	nd Ac	tivity	areas		No. of items	Type of Racks	Details	Qty. of Racks		Area q. ft.
1. Small & Med	lium iten	ıs	•			•		5000	A	Steel Racks (Back to Back)	60)	
2. Bulky Parts			•			•	•	300	В	7'-3"×3'×18" Steel Racks 7'-3"×3'×3'	10	}	
3. Heavy Items	•	•			•	•	•	100	C&D	Custom Built wooden racks.	10	1	
4. Very Heavy a5. Offices	•			Potal	•	٠	٠	50 5450	E	on the floor	N.A.	j	1504 512
6. Receiving & S	Snipping	<u>.</u>				E	2			Total			384 2400

Note: -- Sketches of various types of racks may be seen on subsequent pages.



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STEEL RACKS: "A" Type

Height 7'-3" each angle iron to have holes at 2" intervals-centre to centre. Shelf 36"×18"—thickness 20G. Sides 7'-3"×18" and Backs 7'-3"×36" of 22 /24G. Ordinary Nuts, Bolts and Washers with 4 nos. of Gussets or Corner Flates. These should be painted olive green. Each shelf should be of Allwyn or Godrej design which would then have load bearing capacity of upto 400 lbs per shelf. Each rack would have 7 shelves—one fitted at the bottom i.e. 0',2', 3', 4', 5', 6', and 7'-3".

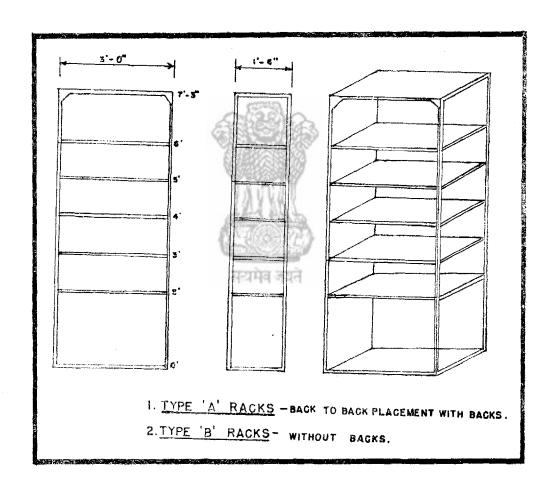
keep the racks back to back thus bins would be 36" × 18" × 24". and 36" × 18" × 12".

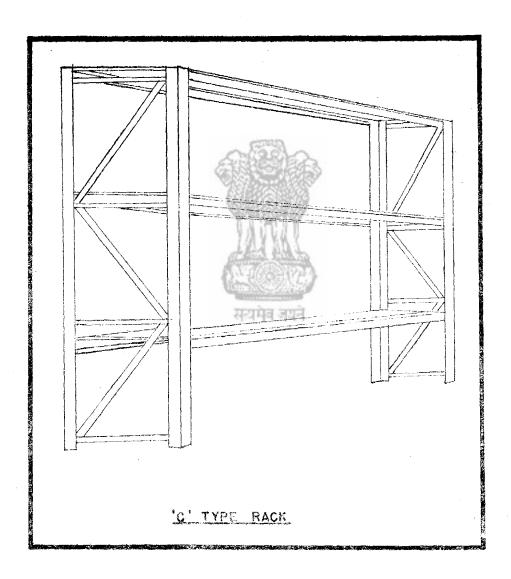
STEEL RACK: "B" Type

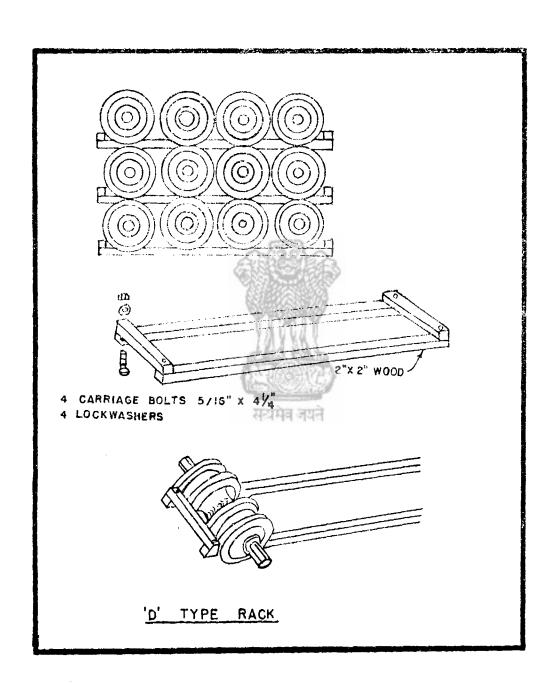
Same as above. Racks would be kept back to back except backs wont' be used. Bin would be $36'' \times 36'' \times 24''$ and $36'' \times 36'' \times 12''$.

Alternative: Welded angle iron frame '7"-3" height, 3' wide and 3' deep). Wooden shelves of 1\frac{1}{2}" thickness.









ITEMS OF WORK TO BE PERFORMED BY C.M.U. AS RECOMMENDED BY THE COMMITTEE OF MINISTERS

- (i) Stock taking of surplus equipment and spare parts of all Irrigation and Power Projects in each State.
- (ii) Making an assessment regarding equipment that can be readily commissioned, or repaired for useful work; and also if this can be rehabilitated on some of the Projects within the State. If not, these should be declared surplus to the CW&PC who would arrange for transfer of such machines to other needy projects under execution or earmark them for deployment on new schemes to be taken up within the owning State, or outside.
- (iii) To list out the items of equipment which cannot be economically repaired and which should be disposed of to the best advantage of the State. If necessary, assistance may be taken from the principal dealers of equipment of various makes.
- (iv) Similar exercise may be carried out in respect of spare parts which are not required for machines working within the State. Such items should be declared surplus and assistance sought from the CW&PC in diverting the surplus spare parts to other needy projects. To the extent necessary, assistance in this regard may be taken from the principal dealers of equipment/other similar service agencies who are recognised dealers of spare parts.
- (v) Periodical review be carried out in respect of the surveys made by the Central Mechanical Units on the lines indicated above. This may be done through periodical meetings of the State Mechanical Organisations on a common forum where above. This may be done through periodica the CW&PC can co-ordinate in the matter.
- (vi) The Mechanical Organisation in each State (in Irrigation and Power Sector) should be strengthened and the work pertaining to rehabilitation of surplus equipment and spare parts should be assigned to an Officer on Special Duty who would co-ordinate with the Central Water and Power Commission for expeditious arrangements to rehabilitate the equipment etc.

APPENDIX 12-2

QUESTIONNAIRE AS ISSUED AND STATE-WISE REPLIES RECEIVED REGARDING THE POSITION OF C.M.U.

Q-1. When was the Central Mechanical Organisation established in the State ?

w.e.f. 23-10-1963. Andhra Pradesh

No C.M.O. is functioning in the State nor the proposal for establishing the Organisation is under consideration of the Govt. of Assam. Assam

There is no separate C.M.O. in the State. Irrigation Mechanical Circle, Patna started functioning w.e.f. February, 1961 in the River Valley Projects Department to perform a part of the functions of Central Mechanical Organisation. Bihar

w.e.f. 2-1-1961. Guiarat

A new Central Mechanical Organisation has been opened recently at Karnal under the Haryana Superintending Engineer Construction Circle No. 1. The Organisation is not yet fully established and it will take some more time to perform the functions assigned to the

Organisation.

w.e.f. 4-7-1964. Kerala .

Proposals for activising the C.M.O. have been forwarded to the Chief Engineer. Some of the suggestions have been accepted and are being implemented when all the suggestions are accepted it will be possible for the Central Mechanical Organisation to play a more effective role in the execution of projects, proper maintenance and effective utilisation

of equipment.

There is no separate C.M.O. in the State. Madhya Pradesh

w.e.f. July, 1959. Maharashtra Mysore w.e.f. 2-4-1963.

There is no separate C.M.O. in the State. One post of Assistant Engineer was sanctioned under the Superintending Engineer, Mech. Circle, Hirakud to assist in the work relating Orissa

to C.M.O. w.e.f. September, 1961.

Necessary proposals for setting up a C.M.O. in the State are under consideration with the State Govt. Rajasthan ·

Tamil Nadu The functions of the C.M.O. is being looked after by a Central Mechanical Circle created

on 1-4-1968.

Uttar Pradesh No C.M.O. has been established. The Superintending Engineer, Central Equipments and stores procurement Organisation Irrigation Department, Lucknow, has been partially performing the functions of C.M.O. A disposal unit was created on 28-10-1970

which is dealing mostly audit paras and audit inspection reports relating to surplus stores,

survey report and auction cases of surplus stores.

West Bengal No information received.

How much surplus equipment (by value and in number of pieces with details of equipment) has been rehabilitated within the State on different projects?

Andhra Pradesh No. of items 276. Value Rs. 2,46,81,000/-

Not indicated Assan

No. of items 31. Value Rs. 19.85 lacs Bihar from July 71 to Oct. 71.

No. of items 89. Value Rs. 36 lakhs. Gujarat During the calendar year 1971.

Not indicated. Harvana

No machine has so far been declared surplus. Kerala

Madhya Pradesh No. of items 434. Value Rs. 304.45 lacs.

Maharashtra No machine has so far been declared surplus.

No information with CMO. The concerned Chief Engineers watch the performance of equipment and arrange rehabilitation separately. Mysore

Orissa Value Rs. 159.85 lacs--from 1958 to 4/1971.

Not indicated. Rajasthan Tamil Nadu Not indicated. Uttar Pradesh Not indicated.

What is the average time taken for such rehabilitation of surplus equipment after its being rendered surplus on one of the completed projects or where, due to completion of a particular item of work, it was no longer required? O-3.

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Andhra Pradesh 3 months to two years.

Not indicated. Assam

One to six months and in some special cases even more depending on the extent of repairs. Bihar

Gujarat Generally within 3 months in the case of working equipment.

Not indicated. Haryana

Kerala Correct details of time taken for rehabilitation are not available.

Madhya Pradesh One week to a few months.

Every year plans are prepared in advance for redistribution of equipment on various Maharashtra

works in the State.

Mysore Not in a position to indicate as the control of the machines are with concerned Chief

Engineer.

Orissa Not indicated. Rajasthan Not indicated. Tamil Nadu Not indicated. Not indicated. Uttar Pradesh

Q-4. How much equipment, by value and number, had to be disposed of to the best advantage of State?

Andhra Pr**a**desh Not indicated.

21-4 CW & PC, ND/75

Assam Not indicated. Bihar Not indicated.

One double housing planning machine costing about Rs. 2 lacs is being disposed of by Public Auction at present. Uptil now no working equipment has been disposed of by Gujarat Public auction.

Harvana Not indicated.

Correct value and numbers could not be furnished. Kerala

Madhya Pradesh 94 Nos.—Purchase value 70·107 Present/disposal value 12·61

Maharashtra 52 Nos. Value—Rs. 41.40 lacs.

The C.M.O. has been acting only in an advisory capacity to find out whether any machine Mysore which has developed sickness could be repaired at an economical cost or it could be

declared as scrap etc.

Orissa Not indicated. Rajasthan Not indicated. Tamil Nadu Not indicated. Uttar Pradesh Not indicated.

How much equipment, by value and number, was transferred, or rehabilitated on projects or works outside the State?

One No. elevating grader and one No. Motor grader was under the process of transfer outside the State. Value of these items was about Rs. 1,20,000/-Andhra Pradesh

Assam Not indicated.

Bihar Not indicated.

During calendar year 1971, no equipment of State P.W.D. has been transferred or rehabilitated outside the State. Gujarat

Haryana Not indicated.

Kerala Correct value and numbers could not be furnished.

M.P.Not indicated.

Maharashtra No equipment has been transferred outside the State.

The Central Mechanical Organisation was not kept informed regarding the equipment transferred or rehabilitated on projects outside the State. Mysore

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Orissa Not indicated.

Raiasthan Not indicated.

Tamil Nadu Not indicated. U.P. Not indicated.

Q-6. What is the organisational set up of the Central Mechanical Organisation and the functions being performed, which may include:

(i) Census of equipment

- (ii) Census of spare parts available on various projects in the State.
- (iii) Purchase of equipment and Spare Parts.
- (iv) Inventory Control of Spare Parts.
- (v) Rehabilitation and disposal of surplus equipment.
- (vi) Organisation of Central, Regional and Field Workshops and Stores.

Andhra Pradesh The Central Mechanical Organization is kept in charge of pool machinery purchased under minor and medium pool. All the records pertaining to these pools, and census of machinery purchased under the above pools, stock account, collection of hire charges, purchase of spare parts required are being maintained. Rehabilitation and disposal of machinery is being done by a separate Committee known as "Screening Committee" constituted by the Govt, during the year 1968. The Committeer ecommends the purchase of new machinery only. When the requirements cannot be met from the available surplus machinery. The surplus equipment is brought to C.M.O. and then issued to the needy projects.

The C.M.O. is also doing the overhauling of machinery in the pool.

Most of the machinery under Irrigation Branch are owned by this Organisation. These machines are issued to other projects/divisions on hire basis. The field workshop at irrigation Projects/Organisations function under this organisation.

Assam · · · · Not indicated.

Bihar · · · · There are four Executive Engineers (Mech.) under the S.E. Mech. Circle, River Valley Projects Department, Patna.

The Central Mechanical Organisation is headed by a Superintending Engineer who is having four Executive Engineers under him and 12 Deputy Engineers.

(i) All the Officers of the P.W.D. in the State send periodical returns of inventory for machinery to Executive Engineer, Central Workshop Division, under C.M.O. These returns are then compiled. Total fleet of machinery owned by P.W.D. is approx. 3700 Nos. costing Rs. 23 crores as per inventory of 9/1971.

Harvana · · · · Not indicated.

Gujarat

Kerala

Maharashtra

There are three divisions under the C.M.O. One division is at Iddiki Project, the other at Anachal and the third division the Civil Branch Central Stores division at Pallom. The third division is dealing with all stock items required for the project works, repaired machines received from workshop, new stocks or stores in the Central Stores.

- (i) Census of all T & P under the Civil wing was prepared in 1969 and a master record indicating condition, location etc. was also prepared.
- (ii) A list of spare parts in Stock at all stores was also prepared.
- (iii) Purchase of all new items of spare parts and equipment is being arranged by Chief Engineer Civil.
- (iv) Inventory control of spare parts of 22 Mogurt Dumpers was introduced as a trial measure with cardex system. This was not extended to other equipment as identical machines are few in numbers.
- (v) Assessment regarding rehabilitation and disposal of surplus equipment has not been made.
- (vi) One Central Workshop at Kulamayu and one field workshop at Moolamattom are now functioning. One central workshop under Mechanical service unit at Anachal is also functioning. Each division is having separate divisional stores.

Madhya Pradesh

• • The Superintending Engineer, E&M, Raipur with five E&M Divisions and 17 sub-divisions is looking after the work of Central Mechanical Organisation. There is a proposal to set up a Central Workshop at Bhopal worth Rs. 333.81 lacs.

· · · There are 3 Superintending Engineers in the Mechanical Organisation of the State.

Two Superintending Engineers are dealing with operation, maintenance and repair to various machines under their control and the third Superintending Engineer dealing with the work of manufacture and erection of Radial and Sluice Gates and Hoists required for the various Projects in the State—

A Central Pool of Machinery has been formed in the State and the same is controlled by the C.M.O. Every year in the month of June census of the machinery existing on various projects is taken and a programme is drawn up for its utilisation on the various projects as per the quantities of earth work to be executed in the working season beginning from Oct. to the end of June of the next year. Machinery surplus to the requirement is arranged for rehabilitating to other projects where the same is needed.

There is one Centralised Mechanical Stores Division at Dapuri, Poona which looks after:—

- (i) Planning and advance procurement of spare parts.
- (ii) Procurement in bulk quantities of misc. materials required for operation, maintenance and repairs of machinery.
- (iii) Planning and procurement of steel.
- (iv) Procurement of import licenses for spares and materials.
- (v) Inventory control of spares and materials stocked in the various Mechanical Stores Sub Divisions in the State.
- (vi) Disposal of surplus spare parts and materials.

Additional requirement for the Central Pool of machinery is decided upon in the meeting of the Chief Engineers and Superintending Engineers.

Bin Card system for spare-parts and materials is followed in the Central Mcchanical Stores Division, Dapuri. Ledger system is however being followed in the Mcchanical Stores Sub-Division situated at various projects.

So far there has not been any equipment surplus to the State.

The State is divided into 3 regions.

In each region there is a Regional Workshop and Stores. Field Workshops are also set up on various major projects to cater for the needs of the machinery operating on these projects. There is also a proposal to set up small repair workshops at Nasik, Satara, Dhulia, Ahmednagar, Bhir and Nagpur.

Mysore

- The Central Mechanical Organisation is headed by a Superintending Engineer who is having 3 Assistant Engineers and 9 Junior Engineers.
 - (i) Regular information is not received from the concerned section.
 - (ii) The C.M.O. has not received any details of the spares available as surplus with other projects.
 - (iii) Every zone is having its own set up to plan and purchase the equipment, as well as spare parts. The Central Mechanical Organisation has been doing this job in the case of zone of Chief Engineer/North/only.
 - The C.M.O. is not having any inventory of the spare parts available in the State. The C.M.O. is not consulted for purchase of spares.
 - (v) The Services of the C.M.O. are not availed of for disposal/rehabilitation.
 - (vi) A proposal to have regional workshops at K.R.S. Mysore and Central workshop at Bangalore have been under consideration.

The Govt. of Orissa constituted a CPM Committee to look into the allotment and effective use of surplus Plant and equipment at Hirakud.

Orissa

Raiasthan

Tamil Nadu Not indicated.

Uttar Pradesh Not indicated.

Q-7. Has the Central Mechanical Organisation played an effective role in execution of work in any of the medium projects, or in providing means of supply of equipment, on "as required basis", for minor works, or smaller items of work? In brief, has the Equipment Pool being operated under the Central Mechanical Organisation.

It can be said that C.M.O. has played and is playing an effective role in providing means of supply of machinery to Pochamped Project. Andhra Pradesh

Not indicated. Assam

A good No. of medium scheme such as Sivapur Dam, Patna Town Projection Embankment Scheme, Horway Dam, Kolmahado Dam, Barehiya Drainage Channel, Amrity and Sikhandi Dams, Sihharsi Dam and Chandam Dam have been completed with the help of earthmoving equipment under the guidance of Mech. Circle, Patna which is functioning as Central Mechanical Organisation. Bihar

Guiarat Planning and requirements for major irrigation projects is done by C.M.O. Planning for Ukai, Dantiwada etc., was also done by Central Mechanical Organisation. Planning of requirement of machinery for medium projects in Saurashtra and Kutch region is done by a separate Mechanical Circle and not by the Central Mechanical Organisation.

Not indicated. Haryana

Kerala The Central Mechanical Organisation has contributed much and played important and effective role in execution of project works. The supervision of all types of mechanical works, operation and maintenance of project machines and construction plants are being done by this unit.

Madhva Pradesh A lot of projects have already been completed.

Maharashtra The Central Pool of Machinery was created under the Mechanical Organisation from 1-4-1967 for execution departmental Major and Medium Irrigation Projects in the State. Earthwork in all Major Irrigation Projects and to many a Medium Projects is being executed by the Mechanical Organisation in addition of some Minor Irrigation works also.

Yearwise earth work executed by the Mechanical Organisation is as under:-

1966-67	236.78	M. cft.
1967-68	222.00	Do.
1968-69	243 · 65	Do.
1969-70	271.98	Do.
1970-71	276 · 57	Do.

Mysore · ·		The C.M.O. is not having any division under its direct control nor this office is being consulted for the purpose of working out the cost of production. The C.M.O. is not having any machinery under its control and as such it has no opportunity to play any part in the execution of works in any of the projects.
Orissa · ·		Not indicated.
Rajasthan ·		Not indicated.
Tamil Nadu ·		Not indicated.
Uttar Pradesh ·	, ,	Not indicated.
Q-8. Has the work required, been	of planning f	or equipment for any medium projects, or for any other item of work where equipment is Central Mechanical Organisation? If so, kindly give brief details.
Andhra Pradesh	• •	No planning for equipment for any medium projects for any other items of work has been done by the Central Mech. Organisation.
Assum •		Not indicated.
Bihar · ·		Planning of plants and equipment for Gandak and Sone Barrage and Tennughat Dam were done by the C.M.O. Planning of construction equipment is now being done by this Office for the projects of Irrigation Departments.
Gujarat · •		The C.M.O. has major function of establishment of workshop schemes in the State.
Haryana • •		Not indicated.
Keralu ·		There is a planning wing working in Chief Engineer's Office, Assessment of preliminary requirements of machinery are formulated in Chief Engineer's Office. Additional requirements of machineries and equipment are furnished by C.M.O. Technical advice regarding selection of equipment is given by C.M.O. when called for.
Madhya Pradesh		All planning for equipment for medium projects is done by the circle as a part of the duties of C.M.O.
Maharoshtra ·	• •	The work of planning of the equipment required for the various major, medium and minor projects in the State is being done by the Mech. Organisation. Machinery valued at Rs. 1129-41, purchased from 1967 to 1971 was planned by the Mech. Organisation. The Organisation also carried out the inspection of unserviceable machinery belonging to the departments/projects other than the Irrigation and Power Sector.
Mysore · ·	• •	The Central Mechanical Organisation is not being consulted by any Chief Engineer for planning the requirements of earthmoving equipment for their projects—major, medium or minor. Therefore, the Organisation had no occasion to plan the requirements.
Orissa ·		Not indicated.
Rajasthan •	•	Not indicated.
Tamil Nadu ·		Not indicated.
Uttur Pradesh ·		Not indicated.
		Appendix 12.3
	NOTE ON	PROCEEDINGS OF THE C.P.M. COMMITTEE IN ORISSA STATE
1st Meeting — 22-12-1961	Rehabilitati Unit and d	on of Earth Moving Machineries, conversion of Hirakud Workshop to a Manufacturing isposal of items from Hirakud Stores.
2nd Meeting	Fixation of unserviceable	Sale value of machineries, procurement of Spares for overhauling of machines, Disposal of e vehicles, Machines, Stores and recognition of Plant and Machinery Committee.
3rd Meeting 6-4-1963	Old items. I	H.L.O. & Darjang Machineries, Release of surplus materials to parties with in and outside Fixation of Hire charges and depreciation values of machineries working in Darjang Project

Old items. Formation of Central Pool of E.M.M., fixation of issue rate and procedure for release of machinery, materials etc. from Central Store.

4th Meeting

18-12-1963

5th Meeting	Old items fruction of investments for Starte Walls and Direction in the Control of the Control o
7-7-1975	Old items, fixation of issue rates for Stock, Tools and Plant items, issue of materials to Government Departments, Undertakings and local bodies and other Governments.
6th Meeting 28-11-1967	Review of Action taken so far. Suspension of repair work of all machines, time given for lifting of the released machinery—one month. The F.A. & C.A.O., Hirakud Dam Project to intimate the Government in the Irrigation and Power Department about the defaulters.
7th Meeting Scheduled on dated 30-12-1967 but postponed.	Review of Action taken so far, Regularisation of transactions regarding machines issued to Darjang project, Disposal of scrap and surplus pumping sets.

APPENDIX 12.4

GUIDELINES FOR THE ESTABLISHMENT OF CENTRAL MECHANICAL UNIT AS ISSUED BY CENTRAL WATER AND POWER COMMISSION

I. Basic steps Required Prior to Setting up a Mechanical Organisation

The first step in establishment of a Mechanical Organisation in a State is for the State Government concerned to define the sphere of operation of this organization. In some cases states have limited the sphere of the Mechanical Organization to the Irrigation and Power Sector; while in other cases, this sphere includes Building and Communications as well as the Health Department.

After the sphere of operations is defined an officer must be assigned to collect information as to the amount and types o equipment available in the State with various Organizations, as well as the probable requirements for additional equipment in the near future. In addition, the possible work load arising from requirements for structural items such as gates, penstocks, transmission line towers, hoists and gantry cranes, etc., must be assessed.

With the above information in hand, the size of the Mechanical Organization, required can be determined and an estimate made and sanctioned.

The next item to be considered is the location and disposition of various projects and important work. Centres where equipment will be or is being employed. When these locations are determined, the present location of all existing workshops must be noted. It can then be ascertained if the present locations of the various workshops are readily accessible to a group of projects or work Centres. It is also essential to evaluate the present installed capacity of each workshop and gauge its possibilities for expansion. If the present layout of the workshops and the area available to them is a logalite to meet the existing work-load and will fulfil future demands for expansion, it is most economical to allow the shops to remain as they are. If the sizes of the workshops and thier set-ups do not afford the necessary capacity and possibilities for expansion as envisaged above, it will be necessary to consider selection of a suitable location to meet the demands of various Projects in each given area. The number of shops and stores and their layouts can then be planned for capacity as warranted by the needs. Major projects, of course, will require adequate facilities to operate efficiently.

II. Recommended Set-up for Workshops

The type of organization envisaged and at present being recommended by C.W. & P.C. is similar to that alredy sanctioned by two of the States, and is as follows:—

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- A. At the headquarters for the organization is a Central Workshop and a Central Stores through which all functioning of equipment and spares for the State concerned is controlled. All specifications for equipment including that for major projects are written by this organization. The tenders for equipment are evaluated by the Officers of the Mechanical Organization and in case of Major Projects, they work in conjunction with the project authorities to evaluate tenders. The central workshops consist of a structural shop, a machine shop and an equipment repair shop. In this equipment repair shop major overhauls are done, but, more important, this shop rebuilds all necessary components to keep the equipment running.
- B. In addition to the central workshops there are regional or project shops. These shops function under the Central shops and take the components from the Central shops as needed for the concerned region or project to do the necessary major and minor overhauls and running repairs.
- C. Attached to each central or regional workshop there are motorized units equipped to do all field and running repairs up to and including changing engines or tracks. These units will have to be equipped and staffed in accordance with the type of machines being cared for. (Staff and tools to repair tractors and scrapers are not the same as for draglines or shovels). In general the unit should consist of a properly equipped work truck and a jeep staffed with a supervisor or foreman, mechanics, helpers, and riggers as required. The number of motorized unis with each central or regional workshop will be determined by the number of machines to be cared for.
- D. In addition to A, B and C above, there should be Field Machinery Units to do lubrication, service and maintenance on small or medium projects, particularly on such works as canals, small bunds, etc. For this work these individual field units should be equipped with three drawn trailers of 5 to 7 tons capacity each. One of these will carry P.O.L. supplies, the second would carry racks for fast running spare parts, nuts, bolts, washers, screws, etc., and necessary tools required for service and maintenance. The third trailer would carry the mobile Workshop unit (equipped for both gas and electric welding). In addition to this a bouser tank 4000 to 5000 gallons capacity should carry high speed diesel oil for dispensing fuel in a clean manner to all the equipments. If these field machinery units are set up in this manner with the four pieces of portable equipment it can be confidently assumed that the breakdowns will ultimately be reduced to the minimum and maximum utilisation will be attained.

In planning this organization it is considered that the Central Workshop would undertake the rebuilding of all components for the machines in addition to doing major overhauls. Regional and project workshops would attend to major and minor overhauls and field repairs. The motorized units attached to each central or regional workshop would take care of running repairs and emergency demands arising in the course of work on medium projects and work centres whether far from or near the Central Workshops. A tentative break-up of the duties to be performed by the Central Workshops, the Regional or Project Workshops, the Motorized Units and the Field Machinery Units must also necessarily be drawn up so that the procedure is comprehensive.

To make the above possible, it is essential for the State Mechnical Organizations to do proper scaling of spares and components. It will be the duty of stores units to obtain sufficient supply of spare engines, water pumps, radiators, fuel injection pumps, track assemblies, transmissions, starter motors, generators, etc. These will be fed to the regional units which can then do major overhuals and attend to any major breakdown by replacement of major assemblies, sending back these damaged or worn components to the Central Workshops where they will be rebuilt if this proves practicable.

In order to reduce the breakdown of equipment to the minimum, it is essential that regional workshops should carry an imprest of the spare parts generally in use. Detailed lists for these spares can be prepared by officers using the equipment from the experience gained in operation of the machines. The quantities however vary from one work centre to another, depending upon the types and makes of equipment to be serviced, the standard of maintenance, and the care taken in operation of the equipment. In addition the regional and project workshops will have sizeable imprest of sub-assemblies, mountings and fittings for all types of machines in use in their areas so that they will be in a position to attend to all fieldbreakdowns rapidly by replacement of sub-assemblies. This work will, of course, be attended by the motorized units. The damaged sub-assemblies can then be repaired in the regional shops if damage is limited, or sent to the Central Workshop if complete rebuild is required.

Such organizations will have a very considerable advantage in as much as a migor portion of the work can be attended to by specialists in the particular work. Senior all-round mechanics will actually only be required in the motorized units and for final inspections at the Regional and Central Workshops. All other regional workshops and project workshops will have skilled hands and semi-skilled hands trained to attend the particular machines in their area.

III. Planning For Shops and Stores

The size of the workshops having been determined, both in view of the total assessed amount—of—equipment to be maintained and the fabrication work to be executed, the layout of the shops must be properly planned, taking into account all necessary facilities that are normally warranted for establishing a modern setup. The principal consideration in planning a proper layout would be the convenience of material handling so that the fabrication costs and handling costs are cut to the minimum. The equipment by way of machine tools—to be installed in the workshops must vary with the type of work to be done.

It must be emphasized that in this planning for the work, adequate attention must be given to procurement of all hand tools in general use in workshops; for repairs and overhaul of equipment, handling of materials, for use in machine shop, in carpentry shop and in smithy shops, as well as in the field. In determining the amount of tools required to maintain the machines adequately, the factors involved are: (1) the total amount of equipment to be maintained. In considering this, an original investment of 2% of the value of the equipment is approximately correct. (2) The number of senior mechanics involved in the maintenance, since there will have to be no less than one complete heavy duty mechanics' tool set for each senior mechanic.

Provision will have to be made for the required special tools and equipment necessary to maintain the various types of earthmoving and transport equipment. This refers to such special equipment as track presses, pullers, etc.

The above discussion amply brings out the fact that the basis of planning must be a result of the information regarding proper census of machinery in hand and that likely to be acquired by the State for work in the future. It is, therefore, vitally important this work be properly done and the first census to be taken for all the machinery in hand in the State should render full information on each machine. When this information is in hand all the machines not working should be shifted either to the location of the Central Workshops or to one of the locations selected for a Regional or Project Workshop. Here they can be torn down to determine the defects to rectified or nature of repairs required. Spare parts lists can then be compiled and processed for procurement.

It is also most essential to make a complete inventory of the existing spare parts already available. Regional stores and warehouses should be attached to the Regional or Project workshops giving due consideration to service facilities to be provided by each base supply unit to various work centres.

The main purpose of setting up the State Mechanical Organisations is to ensure the optimum utilization of Plant and Machinery, which has been heretofore somewhat unsatisfactory. This would necessitate enforcement of well laid maintenance drills yet to be suitbly evolved based on standard patterns already in use. In accomplishing what is envisaged in this maintenance drill, it will be basically essential that full complement of tools and lifting tackle, etc., are adequately provided for.

IV. Necessity For Inspection Organization

The functioning of the various units described above would not be perfect unless an inspection organization is established under the aegis of the State Mechanical Organization. The officer to be deputed must be personally responsible to the Engineer In Charge of the State Mechanical Organization, who should take suitable action after evaluation of the position as reported by the Inspection Officers. In case of machinery working with major projects, the Engineer In Charge of the State Mechanical Organization may have to carry out such inspections personally. It goes without saying that the Engineer In Charge of the Central Mechanical Organization must have control of all the machines within the sphere of operation of the Central Mechanical Organization; while he may not have control of allotment of machines to major projects, good results will require that he at least have technical supervision of the machines.

V. Training Personnel

The present difficulties involved in obtaining suitably qualified mechanical staff brings to notice the problem of providing training facilities for officers, formen, mechanics, etc. The existing Training Centres under the CW&PC can afford this facility to a limited extent. In addition, a suitable training programme can be usefully and systematically introduced for this purpose in the Central Workshops established in each State. This would afford the additional facility of training specialists in operation and mechanical work and gradually distributing them to the various regional work centres for better use. This will contribute substantially towards a solution of the difficult problem involved in obtaining skilled staff for mechanical work. In some cases additional training facilities may be within easy reach in the industrial undertakings and industrial training centres.

VI. Additional Advantages Resulting From the Establishment of C.M.Os.

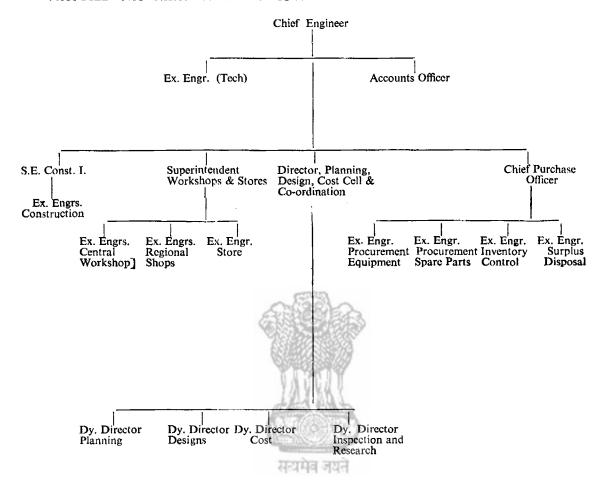
If planning is done in the correct fashion, certain additional advantages can result from the establishment of these Central Mechanical Organizations.

- (1) Building of unnecessary workshops can be avoided. As pointed out above many of the small projects require service facilities only. Although such facilities must have a pukka floor, the balance of the buildings can be prefabricated by using steel trusses and columns with corrugated iron or ACC sheets for roofs and walls. When such a project is completed these structures could be dismantled and moved to the next site of work without sustaining any great material loss. For any given State the type of structures can be standardized. In addition, portable structures for other purposes can be fabricated.
- (2) Standardization of Machines. With regard to standardization, after the complete census of machinery is taken for the State, the machines can be shifted in such a fashion that insofar as possible in any given type of machine, only one make or at the most, two makes need be located at any one work centre. This will simplify operation and maintenance to a very great extent as the personnel connected with this work will not to be skilled on a large number of makes of machines, but only on the makes used where they are posted.
- (3) Referring to the mobile field machinery units mentioned above, it is not the intention that these units be directly under the officer in charge of the Central Mechanical Organization. They would be allocated to the Engineer in charge of the particular work. Nevertheless it must be noted that when a Central Mechanical Organization is established and functioning throughout the State, these units could also all be standardized in order that their parts and equipment could be interchangeable and that people trained to work with such a mobile unit in one location could be readily transferred and still be completely familiar with the unit and its equipment at a different location.

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APPENDIX 12.5

PROPOSED ORGANISATIONAL SET UP OF A CENTRAL MECHANICAL UNIT IN A STATE



INCOME TAX RULES ON DEPRECIATION

Table of rates at which depreciation is admissible

Depreciation allowance as % age Class of asset (i) Actual cost in the case of ocean going ships; (ii) Written down value in the case of any other asset. 1. Mines and Quarries-Surface and underground machinery (other than electrical machinery, boilers and portable underground machinery), head-gear, moving parts and rails (N.E.S.A.) 15% (a) Automatic and Semi=Automatic(b) Precision machine tools Machine tools 15% Road making plant and machinery 20% Ropeway structure—Carriers 20% Electrical machinery . 20% Earthmoving machinery employed in heavy construction works, such as dams, tunnels, canals, etc. (N.E.S.A.) 30% Mines and quarries-Portable underground machinery and earthmoving machinery used in open cast mining (N.E.S.A.). 30% Ropeway structures-Ropeways Ropes and trestle sheaves & connected parts (N.E. 30% Motors, Buses, lorries, taxies, tractors (N.E.S.A.). 30%

Extra shift depreciation allowance

An extra allowance upto a maximum of an amount equal to one half of the normal allowance shall be allowed where a concern claims such allowance on account of double shift working and establishes that it has worked double shift. An extra allowance upto a maximum of an amount equal to the normal allowance instead of one-half of the normal allowance, shall be allowed where a concern calims such allowance on account of triple shift working and establishes that it has worked triple shift.

The calculations of the extra allowance for double shift working and for triple shift working shall be made separately in the proportion to the number of days for which the conern worked double shift or triple shift, as the case may be, bears to the normal number of working days during the previous year. For this purpose, the normal number of working days during the previous year shall be deemed to be—

- (a) in the case of a seasonal factory or concern, the number of days on which the factory or concern actually worked during the previous year or 180 days, whichever is greater;
- (b) in any other case, the number of days on which the factory or concern actually worked during the previous year or 240 days, whichever is greater.

For example, where a non-seasonal concern worked 270 days during the previous year out of which it worked triple shift on 135 days and double shift on another 90 days, the extra depreciation allowance for triple shift working will be 135/270, i.e., one-half of the normal allowance, and that for double shift working 90/270, i.e., one-third of one-half of the normal allowance.

The extra shift allowance shall not be allowed in respect of any item of machinery or plant which has been sepcifically expected by inscription of the letters "N.E.S.A." (meaning 'No Extra Shift Allowance') against it.

SET OF PROFORMAE FOR RECORD KEEPING

1. OPE	RATOR'S LOG SHEE	T (Field Report)		
Equipme	nt Code No.		Date-		
			Shift-		-
			Where	used——————	
No. of h	ours worked		No. o	f trips made	-
POL issu	ed Diesel-		Ltrs.		
Lubi	icants		Ltrs.		
			Ltrs.		
Any defe	cts noticed during opera	ations:—			
			Opera	tor	
Idlo Time			Break	down Time	
Reasons-			AND	Ed.	
Reasons	for low production: (Br	icf Note)	(8)	939	
Repairs o	arried out during Break	down Time:		14	
is used	ion of hours on differer on more than one worthwares:—		DL-200000-243		÷
TOME CO.			सन्य 4-	भूति । स्थिते	
Foreman				Engineer-in-cha	rge.
Recorded					
Record C	Clerk.				
					/E://n A
		,) DAMA EU	ELING REPORT	(Field Report)
Date-	·····	 	. DAILI FU	EDING KEPOKI	
			Fuelin	g Unit No.	
Shift	F	Quantity in	Ltrs.	Signature of Operator after entry	Remarks
	Equipment Code			— in Log Sheet	
Shift——— Sl. No.	No. —	H.S.D.	Petrol	- 	

Recorded.

Record Clerk.

Incharge,

Fueling Unit.

3. DAILY LUBRICATION, REPORT

Date—						Lubrication	Unit No			
Shift—										
S. No.	Equipment Code No.				Quantity is	ı liters	-4			- Remarks
	0044 1101	Engine Oil	Air Cleaner Oil	Gear Oil	Hydrau- lic Oil	Brake Oil	Grease	Cardium Compound	Other	w
1	2	3	4	5	6	7	8	9	10	11
R∝ord	ed.									
Record	Clerk.									
								Incharge, Lubricatio	n Unit-	
Note:	If different g separately.	rades of L	ubricants ar	e used the c	olumns ma	y be sub-divi	ided to in	dicate the con	sumption	of each gra
		4 54		D 4 D 770 C	0	ile.				
_		4. DA	ILY SPARE	PARTS CO	ONSUMPI	ION REPOI	CT (Field	Report)		
Date—		_								
Shift—					W			Estimate N		
S. No.		Equip	ment Code N	No.	Details o	of spare part	s issued			ost
1			2		Company of	3				1
					The state of the s					
					सन्द्रामेव	जयते				
					सन्यमेव	जयते ।				
Records	ed₄				सद्यमेव	जयते				
	=				सद्यमेव	। जयते	E	Incharge-U		
Record Record	=	5.	DAILY ISS	UES OF O				ngineer-in-cha		
Record	=	5	DAILY ISS	UES OF O		OCK MATE		ngineer-in-cha	arge.	
Record	Clerk.	5.	DAILY ISS	UES OF O				ngineer-in-cha	arge.	
Record Date—	Clerk.	5. :	4.00		THER STO		RIALS (F	ngineer-in-cha	No.	narks

(Field Report)

6. DAILY REPORT ON PHYSICAL AVAILABILITY OF EQUIPMENT (Equipment-wise)

Date——Shift——						ប	nit———		
SI.	Equiment Code No.	Total Avai-		Hours kept		Major Re-	Idle h	ours for	
140.	Code No.	lable hours	on work	as stand by	maintenance hours	pairs nours	Want of work	Lack of matching equipment	
1	2	3	4	5	6	7	8	9	10



Recorded.

Record Clerk.

Unit In-charge,

Engineer-in-charge.

ABSTRACT
₹
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BS
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Remarks	Remarks				
Production achieved Shift	Total		15		
achieved	3rd		4		
Production achieved Shift	2nd	:	13		
Pr	1st		12		
	Total		11		
, ,	Other Items		01		
Expenditure on	Spares	•	δ.		
Щ	Lubri- cants		∞		
	Fuel		7		
Shift	Total		9		
s Worked	3rd		5		
Total Hours Worked Shift	2nd 3rd		4		
To	1st		6		
Equipment			7		
Š	~~~ <u>°</u>				



Date.....

(Office Work)

8. MONTHLY LOG ABSTRACT

Equipment Code. No.	Month
(Group of machines of same make and model in the Unit)	

(Group of	f machines o	of same r	nake and	model in	the Unit)
-----------	--------------	-----------	----------	----------	-----------

Date of Month	Hours worked	Production achieved	Co	nsumption		
wonth		achieved	P.O.L.	Spares	Other Stores	Total
1	2	3	4	5	6	7
1				.		
2						
3						
4						
5						
6 7						
8						
9			and the same of th			
10			a light			
11						
12						
13						
14			AND THE STREET			
15			V / UTC / U			
16			TATABLE		,	
17			11.7			
18 19						
20						
21			सन्यमेव जयते			
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						

Signature of Record Clerk.

168
MONTHLY AVAILABILITY & UTILISATION STATEMENT

ont Scheduled o. No. of hrs.	No. of hours ac- tually avai- lable	No. of hours actually utilised	Percentage availability	Reasons for low availa- bility	Percentage utili- sation	for low utilisation	Remarks
3	4	5	6	7	8	9	10
	o. No. of	o. No. of hours ac- hrs. tually avai-	o. No. of hours achours hrs. tually avai- actually	o. No. of hours ach hours availability hrs. tually avais actually	o. No. of hours ac- hours availability for low hrs. tually avai- actually availa-	o. No. of hours ac- hours availability for low utili- hrs. tually avai- actually availa- sation	o. No. of hours ac- hours availability for low utilifor low hrs. tually avai- actually availa- sation utilisation



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Based on 25 working days, the following can be the standard schedule hours:—

Single shift — 175 hrs.

Double shift - 300 hrs.

Three shifts — 400 hrs.

11. EQUIPMENT RECORD REGISTER

(Office Work)

		ı
g hours	5th	15
of working year	4th	14
Age of the machine in terms of working hours at the end of the year	3rd	13
the machinat the	2nd	12
Age of	lst	11
Loca-		10
Date of	ccmmission	6
Source of	purchase	∞
Year of	purchase	7
Purchase	price	9
Purchase	reference	5
H. P. &	capacity	4
Make &	Equipment	3
Equipment	Code No.	2
. 	o	-

Engineer-in-charge.



12 FORM FOR ESTIMATION OF ANNUAL USE RATES OF EQUIPMENT

(Office Work)

	Grand Total	20
	Over Head	19
Repair	provi- sion of tyres	18
	Life of Ciation Tyres of tyres	17
	Life of Tyres	16
	Cost f tyres	15
	Total ⁰	14
	Other Stores	13
Cost	P.O.L.	12
Ownership Maintenance Cost Operating Cost	Opera- ting labour	=
e Cost O	Total	10
intenanc	Other materials	6
rship Ma	Repair Iabour	80
Owne	Repair supply	7
	Interest	.9
	Depre- ciation	5
	Life	4
200	with tyres	3
Cate-	gory of equip- ment	2
	S. S.	

N.B.— (*) Other m uterials should include cost of Wire Ropes, Batteries, Cutting Edges, Bucket Teeth etc.

APPENDIX 13-3

LOAD FACTORS ON SPECIFIC JOB CONDITIONS

Diesel fuel consumption

0.5 lbs. per B.H.P. per Hour \times load factor

Type of equipment Load factors on* specific job conditions

										Excellent	Average	Severe
Wheel type equipment (on road)	•	•	•	•	•	•	•	•	•	0.25	0.30	0.40
Wheel type equipment (off road)	•	•	•	•	•	•	•	•	•	0.50	0 · 55	0.60
Track type tractors · ·	•	•	•	•	•	•	•	•	•	0.50	0.63	0.75
Excavators · · · ·	•	•	•	•	•	•	•	•	•	0.50	0.55	0.60

Note:—*The job conditions Excellent, Average or Severe (or Light, Medium and Severe) can be seen from Appendix 8.9.

APPENDIX 13:4

CODIFIED NUMBERS FOR INVENTORY OF EQUIPMENT

Equipment Main Group Nos.	CORRE	
Excavators	A 128 E	Α
Dumpers		В
Scrapers		c
Tractors	VARIATI	D
Graders	THINK	E
Loaders	AT CONTRACT	F
Compactors		G
Water Tankers	सन्यमेव जयते	Н
Drills	••	I
Compressors	••	J
Crushers	••	K
Scalping, Screening and Feeding	••	L
Washing and Cooling		M
Batching and Mixing		N
Cleaning, Placing and Curing	••	Ο
Pumps		P
Lifting		Q
Grouting	• • •	R
Sheet Piling	••	s
Transport		T
Workshop Equipment	••	U
Power House Equipment	••	v

	EQUIPMENT MAIN GROUP	A-EXCAVATORS		
Face Shovels		001	_	100
Draglines		101	_	200
Backhoes	-	201	_	300
Clamshells	_	301	_	400
Bucket wheels	_	401	_	500
Dredgers	_	501	_	600
Walking Draglines		601		700
	MAIN GROUP B—	DILLEDEDA		
Rear Dumpers	MAIN GROUP B—	OO1		4.00
Bottom Dumpers	_	101	_	100
Shuttle Dumpers	_	201	_	200
Tunnel Dumpers		301	_	300
Side Dumpers	<u> </u>	401		400
		401	_	500
	MAIN GROUP C-	SCRAPERS		
Motorised Scrapers	_	001		100
Elevating Scrapers	Email .	101		200
Twin Engined		201	_	300
Towed Scrapers		301	_	400
	MAIN GROUP D-T	D A CTODE		
Crawler	MAIN GROOF D=1	001		***
Wheeled	13/3/8/8/3	201	_	200
		201	_	400
	MAIN GROUP E-G	RADERS		
Wheeled		001		100
Towed	सन्यमव जयत	101		200
Elevating	_	201	_	300
	MAIN GROUP F	LOADERS		
Crawler		001		100
Wheeled	_	101		200
Muckers		201		
Belt Loaders		301	<u> </u>	300
Reclaimers	_	401	_	400
Belt Conveyors	_	601	-	500
Elevators		701	_	700 760
				750
	MAIN GROUP G—CO			
Self Propelled sheepfoot roller	-	001		050
Self Propelled Vibratory rollers Drawn Sheepfoot rollers		051 101	_	100
Drawn Vibrators rollers	<u> </u>	201	_	200 250
Pneumatic tyred rollers	_	251		300
Smooth Drum Vibratory rollers Wheeled Grid rollers	_	301 351	_	350
Smooth Drum rollers	-	401		400 500
Pneumatic tampers		501	_	600

MAIN GROUP H-WATER TANKERS

Highway truck tankers	-	001		100
Dumper tankers	_	101		200
Conventional off-highway Sprinklers	_	201		300
Towed tankers		301	_	400
MAIN GRO	UP I—DRILLS			
Auger Drills	_	001		100
Core Drills	_	101		150
Rotary or Blast hole Drills	_	151		200
Percussion Drills	_	201		400
Shot Drills		4 01		450
Churn Drills	_	451		500
Tricon Rotary Drills		501		550
Drilling Jumbos		550	_	600
Hydro Booms	_	601	•	650
Pneumatic leg Pushers		651		700
I license to the control of the cont	Court Court			
MAIN GRO	UP J—COMPRE	SSORS—		
Portable diesel Compressors upto 300 c.f.m.		001		100
Portable Electric Compressors upto 300 c.f.m.		101	_	200
Portable Diesel Compressors above 300 c.f.m.		201		300
Portable Electric Compressors above 300 c.f.m.	3 58 3 -	301		400
Compressors Stationary Diesel upto 1000 c.f.m.	7 613 7	401	-	500
Compressors Stationary electric upto 1000 c.f.m.		501	_	600
Compressors Stationary Diesel above 1000 c.f.m.	_	601		700
Compressors Stationary Electric above 1000 c.f.m.	मेव जयते 🗕	701	_	800
Blowers	_	801		900
MAIN GRO	UP K—CRUSHE	RS		
Portable Crushing Plant	_	001	_	100
Jaw Crushers	_	101	_	200
Cyratory Crushers	_	201	_	300
Hammer Mills	_	301	_	400
Cone Crusher	_	401	_	500
Roll Crushers	_	501		600
Rod Crushers	-	601	_	700
Rod Mills	. .	701	_	800
Ball Mills	_	801	_	900
MAIN GROUP L—SCALPING	SCREENING A	ND FEEDING P	LANT	
		001	<u> </u>	100
Revolving Screens		101		200
Vibratory Screens	<u>-</u>	201		300
Grizzling	<u>-</u>	301		400
Feeders	_	501		400

MAIN GROUP M-WASHING AND COOLING Portable log Washers Fine material Washers Coarse material Washers Aggregate Cooling Plant Ice Plant MAIN GROUP N-BATCHING AND MIXING Cement handling Plants Batching & Mixing Plants Portable Batching and Mixing Plants Weigh Batchers Concrete Mixers Paver Mixers Transit Mixers **Agitating Cars** MAIN GROUP O-CLEANING, PLACING AND CURING **Pump Cretes** Concrete Buckets Pneumatic Concrete Placers **Vibrators** Sand Blasting Equipment Concrete Pavers Pavement Breakers Mechanical Booms Concrete Saws MAIN GROUP P-PUMPS सत्यमव जयत **Dewatering Pumps** Lift Pumps Sludge Pumps Well Points Sand Pumps Chemical Pumps Vaccum Pumps MAIN GROUP Q-LIFTING Cranes --- Crawler -Truck Mounted -Mobile -Tower --Gantry -Trestle -O.H. --Tractor Winches and Hoists Fork Lifts MAIN GROUP R-GROUTING Cement Grouting machines Grout Pumps

301 -

Wagon Grouts

Air Motors

MAIN GROUP S-SHEET PILING

Pile Drivers	-	001	_	100
Pile Hammers		101	_	200
		201	_	300
	-	301	_	400
	MAIN GROUP T-TRANS	PORT		
Heavy Transport Vehicles	_	TH		
Truck Tractor Trailers		001	_	100
Semi Trailers	-	101		200
Low Bed Trailers	_	201	_	300
Prime Movers		301	_	400
Light Transport Vehicles	-	TL		
Jeeps		100	A-00	100
Station Wagons		101	_	200
Cars		201	_	300
Trucks	-	301		400
Trailers		401	_	500
Busses		501	_	600
Ambulance Cars	-	601	bound	700
Water Transport	-	TW		
Barges	COMES -	001		100
Tugs	AN 18 18 18 18 18 18 18 18 18 18 18 18 18	101		200
Steamers		201		300
Launches	90 (2) THE STORY	301	_	400
Boats	(於)開放公司第76 1	401		500
Ariel Transport	1874033467	TA		
Rope Ways	V /V i/TC // TI	001	_	100
Cable Ways	TATA 2007	101		200
Rail Transport	Carried Guld To	TR		
Locomotives	15、不可能的公子产生	001	-	100
Wagons	(Capanilla Capanilla 1		200	
Rail Cars		201	-	300
	सन्दर्भव जयत			
	AIN GROUP U-WORKSHOP EQU			
Machine Repair Shop Equipment	-	001	_	100
Machine Shop Equipment	-	101	 .	200
Fabrication Shop Equipment	-	201	_	300
Maintenance & Servicing Equipment	-	301	_	400
Electric repair shop Equipment	_	401		500
Misc. Shop Equipment	_	501	_	600
Tyre Retreading Equipment		601	_	700
М	AIN GROUP V-POWER HOUSE	EQUIPMENT		
Diesel Engines	_	100	_	100
Boilers	_	101	_	200
Turbines	_	201		300
	_	301		
Generators	_		_	400
Electrical Accessors	_	401	_	500

Note:—If a Project has Bottom Dumpers of various sizes the numbers between 101 to 200 set forth for Bottom Dumpers under M in Group B—'Dumpers' can be suitably distributed according to the sizes and makes and Project serial number will be given to the Dumpers accordingly. If a Dumper has been given SI, No. 120 it can be identified as B—120 (B standing for the Main Group 'Dumpers').

The same codified numbers shall not be given to more than one machine even if a new machine substitutes an earlier machine which has been put out of circulation or disposed of.

APPENDIX 13.5

P.W.A. FORM No. 16 REGISTER OF MANUFACTURE (A typical extract from Beas Project Accounts)

AUTHORITY :-- SUPERINTENDING ENGINEER ADMN. & STORES No. 1077-78/166-W, dated 10-3-1969 FOR THE YEAR RS. 15677598/- FOLIO No. NAME OF MANUFACTURE :-W/O D-8 CATTER PILLER TRACTOR DOZER IN BEAS DAM DURING 1969-70 CODE No. 712-606.

Shop Spare Depre- Major Charges Part ciation over- hauling		Lubrica- tion Services	
			Fuelling Lubrica- Fuel and Miscs Services tion Services tion
7 8 9 10	9	5 . 6	3 4 5 6
6,02,550 14,05,575 26.77,425 53,54,850 1,56,77,598	073 6,0	45,40,866 2,54	ESTIMATE PROVISION 6,46,074 54,120 1,42,065 45,40,866 2,54,073 (in Rs.)
.25 5.25 10.00 20.60	1.41 2.25	19.72	नयते
3.50 8.15 15.53 31.06		34.92 1.89	
5.85 13.65 26.00 52.00		40.13 2.11	

	1		2	3	4	5	9	7	8	6	10	11	12	13	14
April, 1969 .	٠		:	:	:	:	:	:	0.11	:	:	0.12	:	:	0.12
May, 1969	•	•	0.24	:	:	1.18	:	90.0	0.18	:	;	1.65	0.04	4.80	(-) 3.15
Total .	٠	•	0.24	:	:	1.18	:	93.0	0.29	:	:	1.77	0.04	4.80	(-) 3.03
June, 1969 .	•	•	0.26	:	:	1.88	:	0.09	0.23	:	:	2.46	90.0	7.19	() 4.73
Total .	•	•	0.50	:	:	3.06	:	0.15	0.52	:	:	4.23	0.10	11.99	() 7.76
July 1969 .	•	•	0.23	:	:	2.53	:	0.10	0.28	2.93	5.87	11.94	0.04	4.83	7.11
Total .	•	•	0.73	:	:	5.39	:	0.25	0.81	2.93	5.87	16.18	0.14	16.82	(—) 0.6 4
August 1969 .	•.	•	0.22	:	:	:	:	0.13	0.33	:	:	69.0	0.05	5.99	(→) 5.31
Total .	•	•	0.95	:	:	5.59	:	0.38	1.14	2.93	5.87	16.86	0.19	22.81	(-) 5.95
Sept. 1969 .	•	•	0.18	0.07	0.18	1.28	0.01	09.0	0.29	:	:	2.62	0.02	6.46	(-) 3.84
Total .	•	•	1.13	0.07	0.18	6.87	0.01	0.98	1.43	2.93	5.87	19.48	0.23	29.27	()
Oct. 1969	•	•	0.11	:	:	0.92		0.47	0.19	0.21	0.43	2.35	0.05	7.14	(-) 4.80
Total .	•	•	1.24	0.07	0.18	7.79	0.02	1.45	1.63	3.15	6.30	21.82	0.29	36.41	(—) 14.59
Nov. 1969	•	•	0.23	40.0	0.11	1.32	:	0.11	0.32	1.30	2.62	90.9	0.02	7.88	(—) 1.82
Total . •	•	•	1.47	0.11	0.30	9.11	1.56	0.05	1.95	4.46	8.92	27.89	0.34	44.29	()16.41
Dec., 1969	•	•	0.25	:	:	:	:	0.42	0.13	:	:	08.0	90.0	8.39	() 7.59
Total .	•	•	1.72	0.11	0.30	9.11	0.02	1.98	2.08	4.46	8.92	28.69	0.41	52.69	()24.00
Jan. 1970 .	٠	•	0.20	:	:	3.68	:	0.58	0.29	:	:	4.75	0.08	10.80	() 6.05
Total .	•	•	1.92	0.11	0.30	12.79	0.02	2.56	2.37	4.46	8.92	33.44	0.49	63.48	(-)30.04
Feb., 1970	•	•	0.22	0.08	0.20	5.30	0.01	0.32	60.0	2.96	5.93	15.10	0.09	12.06	3.04
Total .	•	•	2.14	0.19	0.50	18.09	0.03	2.88	2.45	7.42	14.84	48.54	0.58	75.54	()27.00
March] 1970 .	•	•	0.23	:	:	2.43	:	0.58	0.24	2.94	5.89	12.32	0.07	9.02	(—) 3.30
Total .	•	•	2.37	0.19	0.50	21.53	0.03	3.47	2.70	10.36	20.73	60.86	0.66	84.56	(-)30.30

TYPICAL ANNUAL ESTIMATES FOR OWNERSHIP AND OPERATING COST IN RESPECT OF (i) BOTTOM DUMPERS, (ii) EXCAVATORS, ELECTRIC—7 Cyds., BASED ON 'DECLINING BALANCE METHOD OF DEPRECIATION'— PREPARED BY BEAS PROJECT

(i) Numbers of machines · · · · · · · · · · · · · · · · · · ·	· 36
(ii) Capital cost of each machine without tyres	· 5,00,000
(iii) Residual value of machine at the beginning of the year · ·	· Rs. 2,50,000
(iv) Cost of tyres · · · · · · · · · · · · · · · · · · ·	· Rs. 1,00,000
(v) Life of tyres · · · · · · · · · · · · · · · · · · ·	· 2500 hours
(vi) Total No. of hours already clocked by the machines	· 10,000
(vii) Anticipated working hours during the year per machine in 3 s operation	
1. Owning Cost.	
Depreciation by declining balance method @ 30% from appe	endix
8.4 item 2(ii) · · · · · · · · · · · · · · · · · ·	·=2,50,000×30
	100
	=Rs. 75,000
200	7500 150
Hourly depreciation · · · · · · · · · · · · · · · · · · ·	3500 7
	=Rs, 21·40
	-10, 21 40
2. Operating Cost.	
778 9 44. 9	
(a) Repair Charges.	•
Allowable amount of repairs as % of capital cost from appendix 8.7	=77.5-42.5
	=35%
$Amount = 5,00,000 \times 35 \qquad \cdot \qquad \cdot \qquad \cdot \qquad \cdot \qquad \cdot$	$\cdot = \text{Rs. } 1,75,000$
100	
Hourly rate = $1.75,000$ · · · · · · · ·	-Rs. 50 per hour
3500	
(b) Tyre Costs.	
Hourly Cost = 1,00,000 · · · · · · · · ·	·=Rs. 40 per hours
3500	•
••••	
(c) Operating Labour Charges.	
4 Operators/Mechanics/Machine @ 450/- P.M. · · ·	$\cdot = 4 \times 450 = \text{Rs.} 1800$
Hourly rate $=$ 1800	
25 days × 14 · · · · · · · ·	· =Rs. 5·10
(d) Fuels and Lubricants/Hour.	
Fuel — 25 litre H.S. Diesel oil @Rs. 1·00/lt.	· Rs. 25·00
1.0 litro engine oil @2·40/lt. · · · ·	· Rs. 2·40
1.0 litre transmission oil @2.0/lt. · · · ·	· Rs. 2·00
0.6 litre gear oil @2·0/lt.	· Rs. 1·20
0.2 Kg. grease @4 00/Kg. · · · ·	· Rs. 0·80
0.8 litre Hyd. oil @2·0/lt · · · · •	• Rs. 1·60
Total ·	· Rs. 33·00

(e) F	ilters

(i) 1 No. Primary fuel @ 40	•		•	•	•	•	Rs. 40·00
2 No. secondary fuel filter	@ 40 each	•	•	•	•	•	Rs. 80·00
				Total	•		Rs. 120-00

Filters are to be changed every 240 hrs.

Therefore, rate/hr.
$$= 120 = \text{Rs. } 0.5$$

- (ii) 3 No. lubricating oil filter @50 each for 125 hrs. = Rate = 3×50 —125 = Rs. 1.20.
- (iii) Transmission oil filter @40 each to be changed after 240 hrs. = Rate ×40-240 × Rs. 0.16.
- (iv) 2 Nos. Hydraulic oil filter@ 50 each change after 500 hrs. = Rate = 100-500 = 0.20.
- (v) 4 Air filters @ 250 each = 1000

change after 1000 hrs.

Hourly rate . ·=Rs. 1.00

- (vi) Petty items like grease nipples etc. L.S./hr. ·== Rs. 0.25
- (vii) Lubrication service & fuelling/hr.

== Rs. 2.00

Total = Rs. 33.00

4- 0.50 1.20

0.16

0.20

1.00 0.25

2.00

38.31

Say Rs. 38-30/hour.

(f) Misc. Supply.

like wire ropes, head lamps, battery and battery service etc.--L.S./hr.=5.00

3. Total Owning and Operating Rate/hour

											Rs.
Depreciation	ì	•	•	•	•	•	•	•	•	•	21 · 40
Repairs	•	•	•	•		•	•	•			50.00
Tyres Costs	•	•			•	•	•	•			40.00
Labour	•	•	•	•	•	•	•		•	•	5 · 10
Fuel & Lub	ricar	its	•	•	•		•			•	38 · 30
Misc. Suppl	y &	Smali	Tool	s ·	•	•	•		•	•	5.00
							Gran	d To	lal ·		159.80

Say = Rs. 160.00 hour.

Note: Against item 'c', page 2 preceding, cost of Idle labour for '2' months would be 1800 × 2= Rs. 3600. Distributing this over 3500 Hrs. of annual operation Re. 1/- per hour, has to be added to the total of Rs. 160.00 per hour,

ANNUAL ESTIMATE FOR AN ELECTRIC EXCAVATOR 7 CYDS. (VALUES ARE ASSUMED TO ILLUSTRATE THE METHOD OF WORKING OUT RATE

THE METHOD OF WORK	ING	OUT	RATE
1. Ownership Cost.			
Depreciation,			
Assume capital Cost · · · ·			· Rs. 45,00,000.
Depreciation already carned by the machine by method or declining balance method	straig	ght li	ne · Rs. 25,00,000
The residual price at the beginning of the year = C minus depreciation already earned	apital	Cost	·=45,00,000-25,00,000 =Rs. 20,00,000
Depreciation by declining balance method @15% on three — shift basis from appendix 8.4	(Item	1) ·	$\cdot = 20,00,000 \times 15$
			Rs. 3,00,000
Expected operation hours during the year	•	•	• 4,000
Hourly rate of depreciation • • • •	•	•	• 3,00,000 ÷ 4000 = 75/•
Note: —Full amount of Rs. 3,00,000 will be credited to VI L & F hours actually clocked during the year.	and (debite	,
2, Operating Cost.		à	
(a) Repair Charges.		37	
The machine has clocked 21,000 hrs. already and w	ill wor	k for	4000 hrs in the next year.
At the stage of 21,000 to 24,000 hrs, the permissible	3374915967		•
from appendix 8.7 — (item 14).	64.8		
Amount of repairs = $45,00,000 \times 18 = \text{Rs. } 850.00$	0.	A.	
100	#172	3	
Hourly rate = $8,50,000 \div 4000 = 2,12.50/hr$.	Zentz	9	
सन्यमेव	जयते		
(b) Direct Labour.			A. 500
(i) 3 Operators @ Rs. 600 p.m. = 1800×12	•	•	• = 21,600
3 Greasers @Rs. 150 p.m. $= 3 \times 150 \times 12$	•	•	• = 5,400
9 Cable men @150 p.m. == 9 × 150 × 12		•	-== 16,200
3 No. Bossman @300 p.m. $= 3 \times 300 \times 12$	•	•	•=10,800
(ii) Maintenance Crew			
3 No. Electricians@ Rs. 300 p.m. $3 \times 300 \times 12$	•	•	• == 10,800
3 No. Mechanics @300 p.m. \Rightarrow 3 \times 300 \times 12	•	٠	·== 10,800
	Total		· 75,600
Add leave reserve at [· · ·	•	•	· 18,900
Hourly rate = $94,500 = \text{Rs. } 23.60/\text{hr.}$ 4000	Total	•	• 94,500
(A. P. J. and I. I.)			
(c) Fuels and Lubricants.			1.400.00
350 Kg. Viscolite grease No. 2 @4.25/Kg.	•	•	•==1,488.00
120 Kg. M.P. grease @4/Kg. · · ·	•	•	·== 480·00
**************************************	•	•	-=1,290.00
420 Kg. grease packing @4.20/Kg. · · ·	•	•	·=1,764·00

60 Kg.	B.R.B.	greaso	No. 1	@4·	10/K o					• =246.00
										· = 510·00
200 Lts.										· =410·00
										· =492·00
										• =615.00
120 Lts.										
										=7,541 · 00
	Hourly	rate	=7,54	1.00	÷ 4000	0				=1.88/hr.
	Lubric	ation s	service	•	•	•		•		$\cdot = 1.68/hr.$ 3.56
(d) Miscellan	ncous su	pply a	nd sma	ill toc	ols				•	= L.S. = Rs. 10/- hr.
(e) Electric e	nergy =	=150 u	nits @	.16	•					·=Rs. 24·00
3. Total hourly Re	ate.									
Depreciation		•	•		•					·= 75·00
Repairs				•	•			•		=212.50
Labour	•	•	•					•		·= 23·60
Fuel & Lub.			•		•	•	•	•		•= 3.56
Misc. Supplie	s		•	•			22%			·= 10·00
Elect. Energy		•	•		0	lia.	8) F	3		·= 24·00
					GE.			Total		$\cdot = 328 \cdot 66/\text{hour}.$
								8		·
					B			9		Appendix 13.7
				N	IONT	HLY	cos	ΓАВ	S'TRA	ACT
Equipment Code No./V	Work A	ccount	Code	No.	gi-		144	報		
					1	H		63		Breakup of hours
					Contract of the Contract of th	31000		il a		employed on different works
Month										
Month———— Total Nos. available—			_		स	यमे	नय	ते		
					स	यमे	ৰ লয	ते		Works A/cs Code No. hrs.
Total Nos. available—					स	यमे	ৰ লয	ते		Works A/cs Code No. hrs.
Total Nos. available—Available machine hour	rs				स	यमेव	ৰ লয	ते		Works A/cs Code No. hrs.
Total Nos. available—	rs——— ours.——		-		स	यमे	ৰ লয	ते		Works A/cs Code No. hrs.
Total Nos. available— Available machine hour Estimated Operation ho	ours.—		-		स	यमे	नयः	ते		Works A/cs Code No. hrs.
Total Nos. available—Available machine hours.—Estimated Operation he Actual machine hours.—	ours.—		-		स	यमे	ৰ লয	ते		Works A/cs Code No. hrs. 1 2
Total Nos. available—Available machine hour Estimated Operation he Actual machine hoursOperated during the me	ours.—		-		स	यमे	ৰ লয়	ते	12	Works A/cs Code No. hrs. 1 2 3
Total Nos. available—Available machine hour Estimated Operation he Actual machine hoursOperated during the me	ours.—		-	~	स	यमे	া লয়	1	2	Works A/cs Code No. hrs. 1 2
Total Nos. available— Available machine hours Estimated Operation he Actual machine hours Operated during the me Total repair hours—	ours.—		-		स	यमे	া লয়	1	2	Works A/cs Code No. hrs. 1 2 3 Machine-wise
Total Nos. available— Available machine hours. Estimated Operation he Actual machine hours. Operated during the me Total repair hours— Operational Supplies	ours.—		-		स	यमे	া লয়	1	2	Works A/cs Code No. hrs. 1 2 3 Machine-wise
Total Nos. available— Available machine hours Estimated Operation he Actual machine hours Operated during the me Total repair hours—	ours.—		-		स	यमे	া লয়	1	2	Works A/cs Code No. hrs. 1 2 3 Machine-wise
Total Nos. available— Available machine hours. Estimated Operation he Actual machine hours. Operated during the me Total repair hours— Operational Supplies Fuel/Power. Lubricants. Wire Ropes.	ours.—		-		स	यमे	। नय	1	2	Works A/cs Code No. hrs. 1 2 3 Machine-wise
Total Nos. available—Available machine hours.— Estimated Operation he Actual machine hours.—Operated during the me Total repair hours— Operational Supplies Fuel/Power. Lubricants, Wire Ropes. Cutting Edges.	ours.—		-		स	यमे	া লয়	1	2	Works A/cs Code No. hrs. 1 2 3 Machine-wise
Total Nos. available— Available machine hours. Estimated Operation he Actual machine hours. Operated during the me Total repair hours— Operational Supplies Fuel/Power. Lubricants. Wire Ropes.	ours.—		-		स	यमे	া লয়	1	2	Works A/cs Code No. hrs. 1 2 3 Machine-wise

Total

		N	Machine-wis	se		
		1 2	3 4	5 6	7	
Spare Parts.			,			
Tyres.						
Total						
Labour.						
Operation & Maintenance.						
Repairs.						
Workshop.						
Stores.						
Total						
Overheads.						
Workshop Charges.						
Energy Charges.						
Stores Charges.	100	h				
Other Charges.						
Total			,			
Depreciation	Mill	N .				
Grand Total		7				*********
Standard hourly rate as estimated.	(Cips)	154				
Actual hourly rate as calculated from the month.	सन्यमेव व	ग्राने				
Cumulative hourly rate upto the month for the year		1.1.1				
Cumulative rate upto the year beginning.						
Remarks for variation.						
DECORD OF INFORM	ATION ON S	DADE DA	DEC FOR		A PPE	NDIX 13-8
RECORD OF INFORM.	COUNTING	PARE PAI	KIS FOR	ANNUAL		
Equipment Code No	Nos. off					
	Estimate	d Provision	n in cost Es	stimate Rs.		
Make& Model of machine	For the	period from	n	to		
·	· · · · · · · · · · · · · · · · · · ·	··	Financ	ial years		
	1st 1972-73	2nd 1973-74	3rd 1974-7:	4th 5 1975-76	5th 1976-77	6th
I. Annual provision and consumption.			27/4-7		17/0-11	1977-78
(a) Scaled provision for the year · · ·						
(b) Balance carried forward ± · · ·	•					
(c) Net amount available for the year · · · (d) Consumption during the year · · ·	•					

•			Financial	years		
_	1st 1972-73	2nd 1973-74	3rd 1974-75	4th 1975-76	5th 1976-77	6th 1977-78
II. Provision and expenditure on purchases.						-
(a) Balance at year beginning · · · ·						
(b) Less liabilities (amount of outstandings) to end of last year						
(c) Net provision available at the beginning of year						
(d) Value of Purchase Orders placed during the year						
(e) Payments made during the year · · ·						
(f) Pending liabilities at year end · · · ·						
(g) Balance provision available at year end • • •						
III. Value of Stores.						
(a) Value of balance in stock at year beginning .						
(b) Value of receipts during the year. · · ·						
(c) Value of issues during the year	ETTS)					
(d) Value of items written off or disposed of ·	HAME.	台				
(e) Value of balance in stock at the end of the year		187				

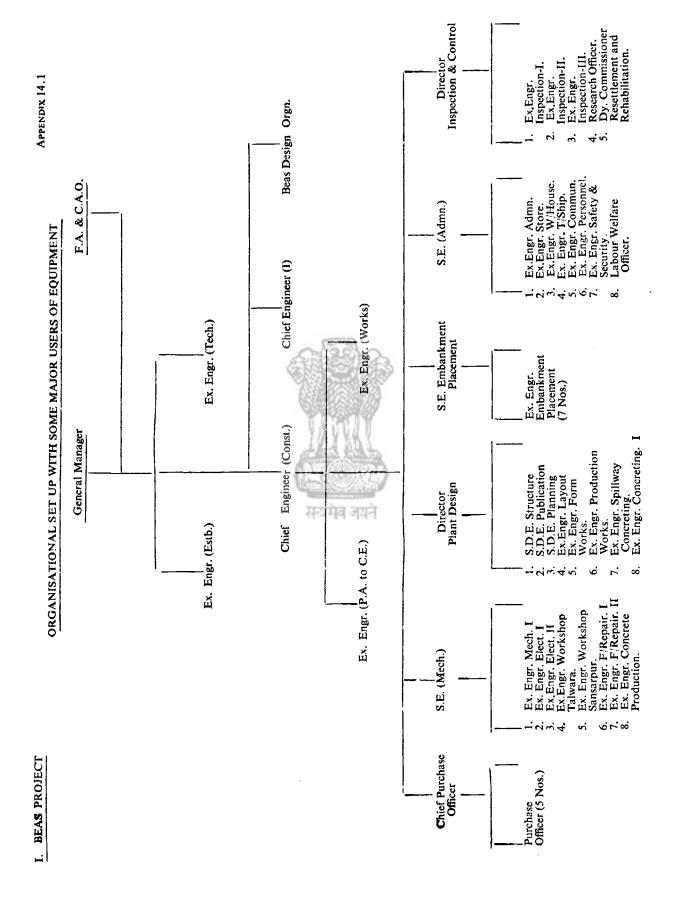
APPENDIX 13.9

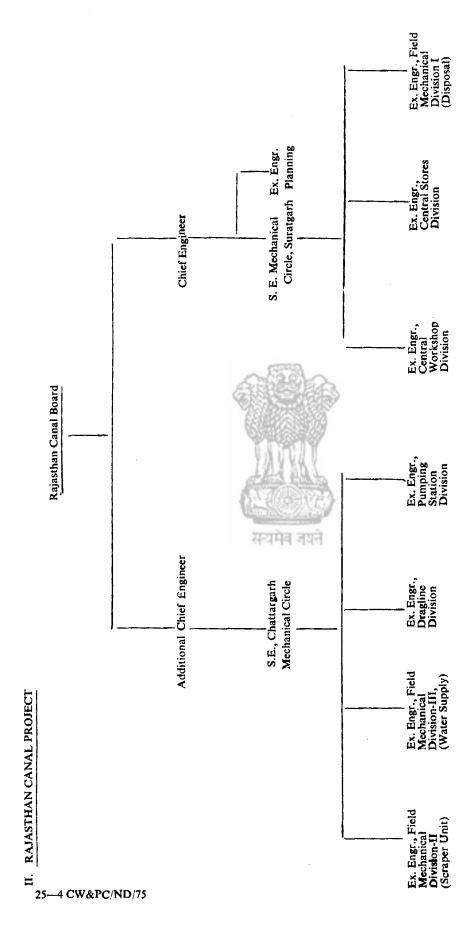
TABLE WORKED OUT TO INDICATE THE YEARWISE INVESTMENT COST, DEPRECIATION, RESIDUAL VALUE, AVERAGE INVESTMENT AND INTEREST CHARGES AT 20% DECLINING BALANCE DEPRECIATION RATE AND 10% INTEREST RATE

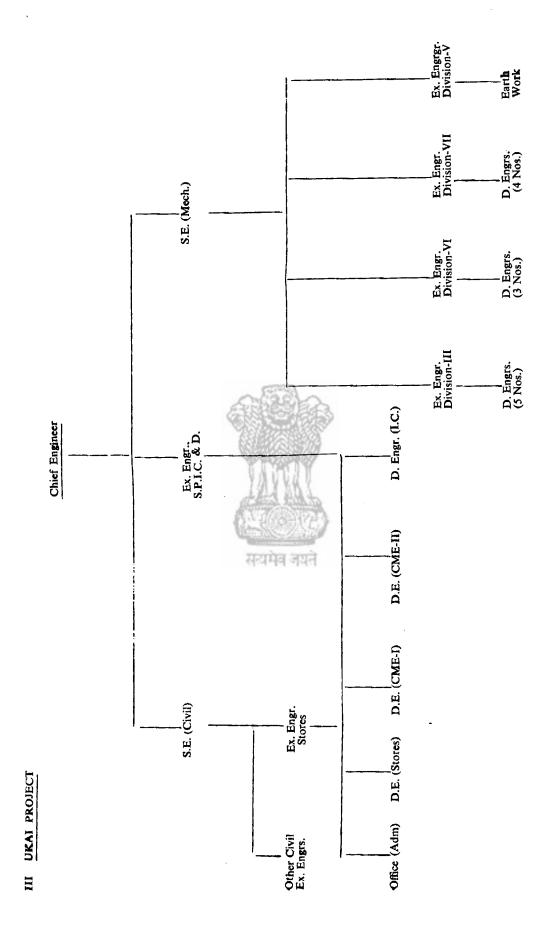
Year	Investment at the beginning of the year	Depreciation for the year at 20% rate	Total depre- ciation upto the year	Residual value at the end of the year	Average annual investment Col. 4	Annual interest charges at 10% rate
			-		Col. 1× rate of depreciation	•
1	2	3	4	5	6	7
	w		TABLE I			
1	100	20	20	80	100	10
2 .	80	16	36	64	90	9
3	64	12.8	48 · 8	51-2	81 · 4	8 · 14
4	51.2	10 · 24	59.04	40.96	73.8	7.38
5	40.96	8 · 192	67.232	32.768	67.23	6.723
6	32.768	6 · 5536	73 • 7856	26.2144	60 · 5	6.05
7	26-214	5.2428	78 · 9284	20.9714	56.38	5.638
8	20.971	4 · 1943	83 · 1227	16·77 7 2	51.95	5 · 195
9	16-777	3 · 3554	86 · 4781	13.4216	48.04	4.804
10	13.421	2.6843	89.1624	10. 7 374	44.58	

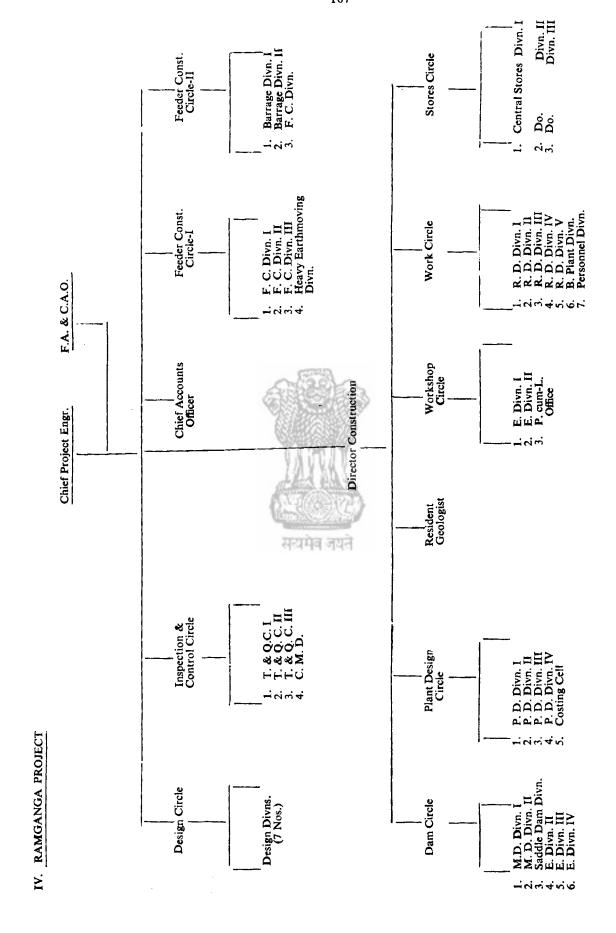
1	2	3	4	5	6	7
		7	ABLE II (Rounded	off)		
1	100	20	20	80	100	
2	80	16	36	64	90	
3	64	13	49	51	81	
4	51	10	59	41	74	7.4
5	41	8	67	33	67	6.7
6	33	7	74	26	61	6.1
7	26	5	79	21	56	5.6
8	21	4	83	17	52	5.2
9	17	4	87	13	48	4.8
10	13	3	90	10	45	4.5

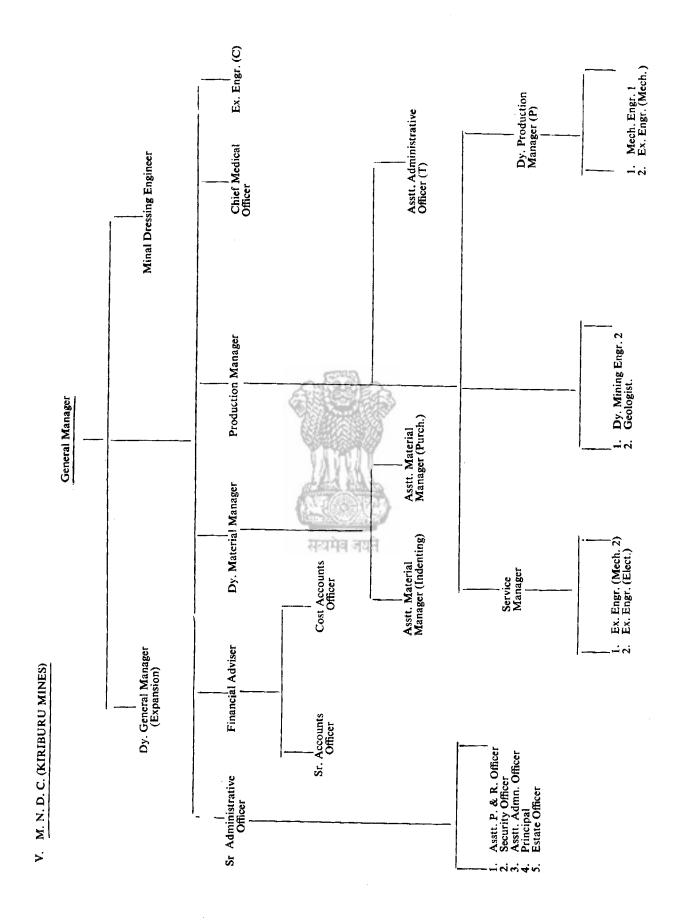












APPENDIX 14.2

Dy. Director Inventory Control (17) D.D. COST CELL Chief Engineer Equipment PROPOSED ORGANISATION FOR PROJECTS USING EQUIPMENT WORTH RS. 100 TO 150 MILLION AT ONE LOCATION D.D.I. Director Designs and Planning S.E. (Stores Plant Planning & Cost Cell XEN STRUCTURAL SHOP XÈN CENTRAL RECEIPT Administrative Officer XEN INSPECTION & Q. C. PLANNING XEN EQUIP 4 STORES XEN (PM)
& TYRES S.E. (Workshops) General Manager (Project) XEN (O & M) XEN (E) XEN TRANSPORT Chief Purchase Officer XEN (R)-III COMPO & SHOP S.E. (Operation and Maintenance) Safety Engineer XEN (0 & M)-III XEN (R)-1 EQUIP. Chief Accounts Officer XEN (O & M)-I XEN (O & M)-II Chief Engineer Works

INCENTIVE BONUS SCHEMES IN IRRIGATION AND POWER PROJECTS

A. 'Beas Project'

- 1. It is felt that the tempo of the tunneling work can be considerably increased with Bonus Scheme, Inspite of, all efforts it becomes difficult to economically tie operations of one shift with others as the workmen look from the point of view of work and pogress in their shift and not of other shifts. For example, if the main job for one shift is drilling, the workmen have a tendency to complete just that work, though they could, with little more effort do other work also, leading to early completion of the over-all cycle, of operation. Introduction of bonus scheme would remove this tendency and all the three shifts would try to work as a team.
- 2. Basis on which the Bonus should be fixed has been under consideration of the senior officers for some time and it is felt that a logical and fair proposition could be to award the saving in direct labour charges accruing from increased progress amongst the officers/staff/workmen employed. Truely speaking, the labour cost as actually obtained should be taken for calculation of bonus but as the estimated cost is the lower the same would be assumed. Indirect benefit of finishing the job earlier, giving earlier return and decreasing the over head would be in addition.
- 3. The work and the part played by each workman is different and while workmen in some of the categories would be more instrumental in getting increased progress other would be less. Bonus points thus to be fixed for each category depending on the efforts required towards greater progress and the work involved. Proposed points are shown category-wise in the attached statements.
- 4.* To make the bonus scheme effective and successful it is necessary that officers including and upto the rank of General Manager, must be made a party to it. While the bonus points for workmen are shown in the attached statements, those suggested for categories of Sectional Officers and above are given below:—
 - (a) Sectional Officers, Civil, Mech. Electrical = 7 points each.
 (b) S.D.Os. Civil, Mech. Electrical = 9 points each.
 (c) Xens. Civil, Mech. Electrical = 10 points each.
 - For an Xen. Electrical For an Xen. Electrical or Mechanical who is incharge of more than one main heading bonus points would reduce to 7.

 - (e) General Manager & Chief Engineer 4 points. (They have less points because they could have 2-3 headings eligible

Total number of points for which bonus would be required to be distributed would vary from Division to Division but are expected to be in the neighbourhood of 1600. Saving to the Government with increased progress with the same labour and staff on excavation on direct labour and electric charges would be as follows:—

In the estimate of excavation from R.D. 21000 to 39952 direct Labour = Rs. 7.58 per cyd. cost provided is.

Electric Energy charges excluding those of welding sets which would be saved with increased progress . . . =Rs. 1.31 Do. =Rs. 8.89

or Say; Rs. 9/- per cyd. or Rs. 31.28 (cyd.) \times 9 = Rs. 281.52 per ft. of the tunnel.

As the work of initial concreting goes on simultaneously with the excavation. increased progress on excavation would also mean increased in progress on initial concreting. On an average there is 9 cyd. of initial concreting per foot run of the tunnel and with direct labour rate of 18.70 per cyd. there would be saving of Rs. 56.10 per foot. Thus total saving would be Rs. 281.52 = +58.10 = 337.62.

Past figures have shown that the progress on Sundarnagar Sutlej Tunnel where finished diameter is 28 feet and quantity of excavation 31. 28 cyd. per foot length crosses the progress of 300 feet per month at the main heading with considerable efforts. Progress of 340 feet has been achieved only in December at one of the headings where work has been in progress for the last 20 months. On the Pendoh Baggi tunnel where finished diameter is 25 feet and quantity of excavation 26.13 cyd. per foot, the maximum figure once touched was 408 feet but the average for the last 12 months from 1/68 to 12/68 from Baggi and has been 224 feet and from Pandoh end 232 feet. Low figure is due to bad strata encountered every now and then. The same cannot be ruled out for future also.

Based on the past experience normal progress of Sundarnagar Sutlej tunnel is recommended as 300 ft. Presuming that the Bonus incentive would give a progress of 350 feet, the bonus earned would be as follows:—

- (a) For excavation 50 feet \times 31.28 cyd. \times Rs. 9.00 = 14,076.00
- (b) For concreting 3 cyd. \times 50 feet \times 18.17 = 2,725.50

=16,801.50

Bonus per foot increased progress

$$\frac{16801.50}{50} = \text{Say};$$

Bonus value for 50 feet increased progress on Sundarnagar Sutlej tunnel would thus be Rs. 16801.50=Say Rs. 10/- per point

1600

Foreman excavation would thus get $5 \times 10 = Rs$. 50/- Xen $10 \times 10 = Rs$. 100/-. This is reasonable to tempt them to put in harder work and at the same time not out of proportion to their normal wages.

Calculating on the same basis, for Pandoh-Baggi tunnel, bonus per foot of increased progress would be as follows:

- (i) On excavation direct Labour saving =Rs. 8.28 per cyd.
- (ii) Saving in Electric charges excluding those of welding sets . . . = Rs. 1.50 Do. = Rs. 9.78 per cyd.
- or Rs. $9.78 \times 28.18 = 256.04$ per foot.
- (iii) Saving in direct labour charges for concreting =Rs. 14.00 per cyd. and assuming 3 cyd per foot. =42.00 per foot.
- i.e. total of Rs. 298.04 per foot. Say Rs. 298.0 per foot.

For uniformity this figure would also be for Sundarnagar Sutlej tunnel.

Considering rock conditions and the size of the tunnel, it is recommended that bonus should be made payable over a normal progress of 350 feet per month for Pandoh-Baggi Tunnel.

- 7. Labour strength and the categories of staff would vary from division to division and cannot be fixed. However, two broad features need to be approved by the Beas Construction Board:—
 - (a) Bonus of Rs. 298.0 per foot would be payable for progress in excess of monthly progress of 300 ft. on Sundarnagar Sutlej Tunnel and 350 ft. on Pandoh Baggi Tunnel.
 - (b) It would be distributed in accordance with the points fixed for each category.

When any heading becomes entitled to Bonus, the Executive Engineer, incharge would collect the figures of staff actually employed in various fields such as Electrical, Civil, Mechanical and calculate the bonus earned, total bonus points and the value of each point. He will then calculate bonus admissible to each person and prepare the rolls for both workmen and officers for payment. This expenditure would be charged to the estimate of the work. Calculations leading the value of the points and the preparation of the rolls would be submitted by him to the C.A.O. who would make payment after check.

Progress for which Bonus would right become eligible needs to take into consideration the starata, and the tunneling methods, dictated by the machinery available etc. It would therefore, be necessary to review the figures for which bonus should be granted every 1/2 yearly. Recommendations made in this Memorandum would thus be applicable from 1-1-69 to 30-6-1969.

*It was subsequently decided by the Bonus Scheme Standing Committee that Gazetted staff should not be included in the Bonus Scheme and that bonus should be payable to workcharged staff and to Sectional Officers only. In order to provide encouragement to gazetted staff in the rank of Sub-Divnl. Officers and Xens. for achieving the desired objective, they may be given a suitable honorarium as may be decided by the Standing Committee of the Beas Construction Board. on the basis of overall performance during the year.

Proposed Points Statement for Civil Staff

								ON TUN	Y IN-	WORKIN TUNNEL THE TU ATIONS		SSISTING
·							No. of Workmen	Proposed Bonus points	Total	No. of Workmen	Proposed Bonus points	Total
1							2	3	4	5	6	7
Foreman Special .							4	5	20	1	3	3
Asstt. Foreman Special							8	4	32	3	2	6
Foreman Misc., Asstt. F/M Chargeman all categorie	Man, es	Asstt		oremai	Mi	isc.,	34	4	136	12	2	24
Supervisors, Works Inspe Store-Munshi, Store-kee	ctors,	. P.W	.I., \ ·			es,	5	2	10	6	1	6

1	2	3	4	5	6	7
Rock Drillers, Drillers, Operators Diamond Drill, Blastman, and their assistants/ apprentices or juniors	140	3	420	••	••	
Steel Erector, Rigger, Structure Steel fitter, Fitter erection, Turner, Auto Mech., Welders, Blacksmith, M.T.O., and their assistants/apprentices or juniors	37	2	74	21	1	21
Loco Operators, Minkey Loco Drivers, Dinkey Line Loco Drivers, Euclid Operators, Drivers, and their asstt./ apprentices of juniors	26	3	78	18	1	18
Carpenter all grades, Masons, Concrete finishers, painters, Vibrator Operators, and their asstt./apprentices or juniors	44	2	88	19	1	19
Mixer operators, Pumpcrete Operators, Pump Drivers, and their Asstt./apprentices or juniors	10	2	20	6	1	6
Crane/Operators all grades, Dragline Operators, T.P. Operators all grades Tractor operators, Compressor Operators, Dump man and their Asstt./apprentices or juniors.	2		••	8	1	8
Mate, T. M., Mate, Mucker, Skilled Workman, Gang Man, Gang Mate, Key man, Points Man, Bheldars, Cleaners Clean up man	500	1	500	240	1	240
Mucker operators of all designations including Foreman Spl. Asstt. Foreman Special, Chargeman Spl. Tractor Operators Euclid Operators, Rock Drillers	8	4	32	••	••	٠
TOTAL		2	1,414			351

PROPOSED POINTS STATEMENT FOR LAYOUT CREWS

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Categories

Working inside the tunnels directly involved on tunnel headings

															ings		
														•	No. of Workmen	Proposed Bonus points	Total
Foreman Spl. all grades, S	Asstt. upervi	Foren	nan S Vorki	pl: : nistr	Forei ies	nan M	lisc.,	Asstt.	Fore	man l	Misc.,	Char	gemar •	of	2	2	4
Surveyors		•										•			6	2	12
Beldars, Mates	, T.M	. Mate	e, Ski	lled	Worl	kmen	•		•	•	•	•	•	•	15	1	15
		Тот	TAL		•	•		•		•	•	•	•	•			31
Inspection Cre	w:																
Foreman Spl. A	Asstt. l	Forem	an Sp	ol. F	orem	an Mis	c. As:	stt, Fo	rema	n Mis	c., S uj	perviso •	or, Wo	ork∻ •	2	2	4
Surveyors		•											•		6	2	12
Beldars Mates	, т.м	. Mate	e, Ski	lled	Worl	kmen	•				•	•	•	•	15	1	15
	Tor	AL						•	•	•							31

PROPOSED POINTS STATEMENT FOR ELECTRICAL STAFF

WORKING INSIDE THE WORKING OUTSIDE THE TUNNELS DIRECTLY IN- TUNNELS BUT ASSISTING VOLVED ON TUNNEL THE TUNNELLING OPERHEADINGS No. of Propos Workmen Bonus Proposed Total Proposed Total No. of Workmen Bonus points points Foreman Spl. . Asstt. Foreman Spl. . Foreman Misc., Asstt. Foreman, Asstt. Foreman Misc. Chargeman of all categories Electrician all grades, Wireman, Lineman of all grades, Welders, Fitter and their asstt./apprentices or juniors Compressor operators and Fitters on compressors . . Beldars, T. M. Mates, Skilled Workman, Cleaners TOTAL

PROPOSED POINTS STATEMENT FOR MECHANICAL STAFF

WORKING INSIDE THE WORKING OUTSIDE THE TUNNELS DIRECTLY IN- TUNNELS BUT ASSISTING VOLVED ON TUNNEL THE TUNNELING OPERATHEADINGS

				* * *			
-	No. of Workmen	Proposed bonus points	Total	No. of workmen	Proposed bonus points	Total	
1	2	3	4	5	6	7	
Foreman Special · · · · · · ·	3	5	15	1	3	3	
Asstt. Foreman Spl. · · · · · · · · · · · · · · · · · · ·	3	4	12	2	2	4	
Foreman Misc. Asstt. Foreman, Asstt. Foreman Misc. Chargeman of all categories	10	3	30	3	2	6	
Mechanics of all grades, Fitters of all grades and their Asstt./Apprentices and juniors	25	3	75	8	2	16	
Welders and their Asstt./Apprentices or juniors · · ·	6	2	12	10	1	10	
Pump Operators of all grades, M.T. Os., Drivers Turners, Blacksmith and their asstts./apprentices and juniors	20	2	40	14	1	14	
Beldars, T.M. Mate, Greasers, Cleaner	55	1	55	23	1	23	
TOTAL			239			76	

- B. Mula Incentive Scheme
- Objest of the Scheme: -- This scheme envisages acceleration of production and consequent reduction in unit cost by giving incentive to the concerned staff on earthwork of Mula Dam.
- Scope of the Scheme:—The scope of the scheme is for the time being restricted to the following zones of earthwork:—
 - (a) Hearting zone;
 - (b) Semipervious zone;
 - (c) Sand zones (including sand filter).

- The scheme shall be operated on experimental basis for a period of 4 months from 21-1-1971.

 Steps in preparing scheme:— The following steps in preparation of the incentive scheme for earth dam construction have been considered :-
 - (a) Fixing the norms of standard output of earthwork,
 - (b) Evolving methods of finding out extra output,
 - (c) Finding out savings according from the scheme,
 - (d) Establishing a correlation between the incentive amount and the economy affected.
 - (e) Working out equitable and just formulae for distribution of the incentive amongst the participants, and
 - (f) Inserting suitable provisions for a speedy implementation of the scheme.
- Basis of the Scheme:— The scheme is based on the measurement of output on each of the three zones separately for each shift of the day. The output in each shift shall be measured on the basis of No. of trips and predetermined compare volume capacities of the hauling units such as scrapers and durpers. At the end of the month these figures of output shall be corrected by applying an appropriate reduction factor so as to bring the figure of total output arrived at one the trip bas in conformity with the output on the basis of monthly measurements of cross-sections of the dam.
- Norm of standard output: The standard output shall be taken for the time being as 46 and 40 brass per shift per hauling machine but on the works for scrapers and dumpers respectively regardless of the No. of hours of work done by any machine during the shift. In respect of machines in very poor condition which do not ply for more than two hours per shift, their number and output shall be excluded from the scope of this scheme. The norms of output given above may be varied at the discretion of the Superintending Engineer, Mechanical Circle (CP), Poona.
- Measurement of extra output:—The extra output on any zone in a shift shall be arrived at by deducting the standard output from the actual output on that zone (arrived at after applying appropriate reduction factor as indicated in clause 4 above).
- Economy:—The economy effected in respect of work on any zone in a shift shall be arrived at by the following formula:-

E=F×Extra output

where

standard output

E=Economy in rupees.

F=Fixed charges of the shift calculated on the basis of method indicated in clause 8 below.

- 8. Fixed charges of a shift:--
- 8.1 The fixed charges of a shift for a zone shall be calculated by adding fixed charges per shift of all the earthmoving equipment and the daily emoluments of the civil supervisory staff on the field working on the concerned zone.
- 8.2 The fixed charges of the earthmoving equipment per shift shall be taken as equal to 50% of its plant hourly rates. If for any equipment the plant hourly rates are not prescribed, the fixed charges shall be taken as equal to the prescribed daily charges.
- 8.3 The fixed charges in respect of the civil supervisory staff for a shift shall be computed from the total monthly emoluments divided by 25. The monthly emoluments shall be calculated on the basis of initial starting pay in the pay-scale irrespective of the actual pay drawn.
- The fixed charges shall be calculated on the basis of minimum strength of earth moving equipment and civil supervisory staff required for the job.
- Incentive amount: The total incentive amount to be distributed to the concerned staff in respect of extra output done on any zone in a shift shall not exceed one third the economy arrived at under clause 7 above subject to the proviso that it shall be further reduced suitably so as to restrict the payment to any operator in category 'A' indicated in clause 11, to a figure of Rs. 4.00 per shift. Such restrictions shall automatically cause corresponding restrictions in the incentive amounts of other categories mentioned in clause 11.

10. Eligibility for receiving the incentive amount:—

The following persons shall be eligible for receiving the incentive amount under this scheme.

- (i) Deputy Engineers in charge of civil earth work, and Quality Control Sub-Divisions, Civil and Mechanical Deputy Engineers working on the shifts, Mechanical Deputy Engineers in charge of heavy earth moving machinery and tractors, tankers and rollers.
- (ii) Those Civil and Mechanical Overseers, Sub-overseers, Mistries, Karkoons, Mukadams, Technical Assistants and Laboratory Assistants who conduct field supervision, Civil staff who conduct or supervise Quality Control in respect of any zone of earth work under the perview of this scheme.
- (iii) Timekeeprs in charge of recording daily machinery performance and outputs even if they work in office. Drivers of inspection vehicles and pick-up vans of Deputy Engineers mentioned in (i) above and of concerned Executive Engineers.
- (iv) The Mechanical staff such as foremen, operators of heavy earthmoving machines, operators of tractors, tankers and rollers and quarry generators, senior assistant mechanics, mechanics, fitters, welders, tins withs, carpenters, helpers, cleaners, operators of pumps feeling overhead tans on shift, electricians, wherean, working in field or in repairs sections directly connected with upkeep and repairs of the heavy earthmoving machinery and tractors, tankers and rollers.
- (v) Selected Office staff members in Civil and Mechanical Sub-Divisions and Divisions as recommended by the concerned Civil or Mechanical Executive Engineer.
- (vi) Any other persons whose efforts are, in the opinion of the Superintending Engineer, Mechanical Circle (CP), Poona or Superintending Engineer, Deccan Irrigation Construction Circle No. 1, Nasik, heipful in pushing up the progress of Mula Earth work.
- 11. Categories of eligible persons:— The persons eligible to receive the incentive amount under clause 10 above shall be divided in the following three categories:—

Category 'A': (Particular category)

This shall include operators of draglines, shovels, pushers, traxcavators and hauling units such as scrapers and dumpers connected with the zones coming under the perview of this scheme as their work can be directly related to the concerned zone of work.

Category 'B': (Common Category)

This s'tall include all persons held eligible under clause 10 excepting (a) the Gazetted Officers, (b) persons in category 'A' above, (c) selected office staff members and (d) other persons listed at S. No. (vi) under clause 10 above.

Category 'C': (selected category)

This shall include the gazetted officers, selected office staff and other persons indicated at Sr. No. (i), (v) and (vi) above

- 12. Basis of distribution of incentive amount:
- 12.1 For the purpose of distribution of the incentive amount under this scheme a relative value in terms of units of incentive amount shall be assigned to each person in categories 'A' and 'B' above on the basis of relative part played by persons in each post in increasing the output and the No. of zones from which they are eligible to draw incentive amounts.

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- 12.2 Persons in category 'A' shall be eligible to get the incentive amount only in respect of the economy accruing from the zone on which they have worked during the shift under consideration. Persons from category 'B' shall be eligible to receive the incentive amount from any of the three zones.
- 12.3 The relative unit value to be given to each person in terms of the units of incentive amount shall be as given below:

	Designation	Relative value in Units										
(A)	Particular Category											
	(i) Operators of shovels, draglines, traxcavators, scrapers and dumpers	4.00										
(B)	Common category											
	(i) Overseers, Foremen, operators of dozers and heavy tractors · · · · · · · · · · · · · · · · · · ·	0.5										
	(ii) Senior Asstt. Mechanics	0.4										
	(iii) Technical Assistants, Sub-overseers, Electricians, Wiremen, Light Duty Operators, Drivers on Water Tankers	0.3										
	(iv) Time keepers, Mistries, Karkoons, laboratory Assistants, Mechanics, Fitters, Welders, Tinsmiths, Carpentors, Operators of pumps for feeding overhead tanks during the shift	0.2										
	(v) Helpers, cleaners, Mukadams, drivers of jeeps and pick ups	0 · 1										

- 13. Method of distribution of the incentive amounts:—
- 13.1 The incentive amounts accruing in accordance with clause 9 shall be worked out separately for each zone during a shift

The amount for each zone shall be divided in three portions as under:---

Portion A : 20% to 28%

Portion B : 57% to 70%

Portion C: 10% to 15%

TOTAL 100%

The exact percentage to be apportioned in a shift to each of the portion shall be at the discretion of the Executive Engineer Mechanical Division for Mula and Girna Projects, Ahmednagar.

- 13.2 Portion 'A' of the incentive amount shall be distributed equally amongst the operators of category 'A' who worked on the concerned zones as each operator carries the same unit value viz 4. This distribution may preferably be made at the end of the month when the reduction factors on the basis of cross-sectional measurements are known. However, the Executive Engineer, Mechanical Division for Mula and Girna Projects, Ahmednagar, may, at his discretion, make provisional payments (to be adjusted at the end of the month) by applying suitable conservative reduction factors at fortnightly or weekly intervals. It is essential to maintain for operators in category 'A', a register showing the incentive amount earned by each during each shift in a month and provisional and final payments made to him from time to time.
- 13.3 The incentive amounts accruing from portion 'B' in a month shall be pooled together and distributed at the end of the month amongst the persons in category 'B' in proportion to the unit value assigned to each. No person in category 'B' shall be eligible to receive the incentive amount of a month unless he has worked for at least 20 days in that month.
- 13.4 One fourth the amount accumulating from portion 'C' shall be kept in reserve at the disposal of the Executive Engineer Mechanical Division for Mula and Girna Projects, Ahmednagar, who may in consultation with Executive Engineer Mula Dam Division, Ahmednagar, utilise part or full of it at suitable intervals in giving token rewards to any person in Government service in appreciation of his work on Mula Dam irrespective of whether or not such person is eligible ro receive incentive amount under clause 10. The token rewards can be paid in addition to the incentive amount which such person might have otherwise earned.
- 13.5 Three fourth of the amount accumulating from portion 'C' and the undisbursed amount if any under clause 13.4 shall be pooled together for a period four months and shall be distributed on ad-hoc basis amongst the persons listed in clause 11 under Category 'C' as per distribution to be decided by the Superintending Engineer, Mechanical Circle (CP), Poona in consultation with Superintending Engineer, Decean Irrigation Construction Circle No. I, Nasik.

14. Safeguards:-

- 14.1 The Executive Engineer, Mechanical Division for Mula and Girna Projects, Ahmednagar, or the Executive Engineer Mula Dam Division, Ahmednagar, has the power to disqualify any operator who indulges in dangerous speeds and rough use of the machines or who neglects to comply with the instructions given to him or neglects to work on the machine to its full load and capacity. Such disqualifications may be for a period of one or more shifts or part or whole of a month.
- 14.2 The incentive amounts shall be proportionately reduced if the utilisation per machine shift of the hauling machines is less than 4 hours and $3\frac{1}{2}$ hours respectively for scrapers and dumpers. These norms of utilisation may be varied at the discretion of the Executive Engineer, Mechanical Division for Mula and Girna Projects, Ahmednagar.

15. Mode of payments:

As the incentive amounts to be distributed under this scheme arise from the saving in expenditure on works, their payments should be treated as expenditure on works and should be debited to the respective sub-heads of work. The payments shall be made by the Executive Engineer, out of his works cash on hand receipt or any such suitable form.

16. Review of the scheme:-

As the scheme is introduced on experimental basis, the Superintending Engineer Mechanical Circle (CP), Poona shall submit to Government reports at the end of two and four months from the commencement of the scheme making comments on the practical performance of the scheme, its effect on the output and suggestions for improvements in the scheme so as to make it fit for its general application to other major earth dam in the State.

SUPERVISORS' & EXECUTIVE TRAINING SCHEME

In relation to supervisors' training it may be programmed to train, in four sessions annually, each of ten weeks duration, 30 persons per session of the rank of Supervisors/Overseers, Assistant Engineers, Assistant Executive Engineers and Executive Engineers.

The supervisors can partly be trained on-the-job or through class-room lectures. In so far as the class-room lectures are concerned, in specific relation to the proposal for training of officers of the rank of Assistant Engineers and above, upto the Executive Engineers level, it can be suggested that such a training programme be organised under the aegis of the CW&PC at Delhi itself. A training programme could be so scheduled that the facets of equipment selection, equipment application systems of earth-moving, maintenance and preventive maintenance of such equipment, work standards and unit requirements for production and spare parts scaling respectively, inventory control, organising workshop facilities etc., etc., can be covered by lectures to be given by experienced and senior officers. Besides regular instructors to impart instructions on various facets of the subjects, officers can be drawn from the cadre of the CW&PC, the Irrigation and Power Projects, Iron Ore and Coal Mines, Specialits in the Army Headquarters, Materials Management Organisations and some of the Public Sector Undertakings or the Bureau of Public Enterprises. Reputed dealers of equipment could also be invited to give class-room lectures. Films and audio-visual means could be used for giving proper training in different facets of problems, as indicated above.

The above system of training for officers of the rank of Assistant Engineers and Executive Engineers, would bring about a tremendous change in the operation and use of equipment on construction work, or wherever the equipment is to be used.

The officers who would deliver lectures, can be drawn from a panel of names to be prepared in consultation with various other departments. Each officer may be involved for giving such lectures twice a year and with the total duration of his association with the lectures being not more than six days, each time.

In relation to supervisory staff training, persons having to be picked up from various fields of their employment, it may not be necessary to prescribe any qualifications for this purpose. It is, however, considered necessary to indicate here that it will only further the cause of development of better attitudes to work for those entering into construction industry, if the syllabi and curricula of education in the Engineering Institutes are suitably modified to include the subject of "Construction Methods and Equipment, and Fundamentals of Maintenance Engineering". The Civil Engineering and Mechanical Engineering Courses may include this subject in the third and the fourth years of education in these Engineering Institutes. This would help the Graduate Engineers turned out by these Institutes to familiarise themselves with the basic fundamentals of construction methods and the characteristics of the equipment used in construction work. They would also imbibe the hasic fundamentals of Maintenance Engineering which are necessary for management and control of equipment in any field of construction work. This would further infuse a feeling of confidence in the minds of the the fresh Graduate Engineers to handle the work in construction industry.

APPENDIX 14.5

SUGGESTIONS RECEIVED FROM UNIVERSITIES/ENGINEERING COLLEGES-ABSTRACTS OF

S. Name of the No. College/		Present activities	Further Suggestions	Remarks received			
		3	4	5 .			
in	egional Engineer- g College, War- gal.	Some topics on the subject of "Construction Methods and equipment" and "Maintenance Engineering", are included in the "Electrical and Mechanical Technology" in the 3rd year of the 5 year B.E. Degree course. From the next academic year, 52 year B.E. (Sandwich) Course laying more emphasis on plant training is proposed to start.	It is felt that in field like Civil Engineering, it may be possible to include "Maintenance Engineering" etc., in the curriculum and in the field of Mechanical Engineering it will not be practicable to devote time on specialised and routine maintenance problems of highly varied construction Equipment.	Any change in the curriculur to be got approved by Osmani University to which the colleg is affiliated.			
		in this course a full paper on "construction equipment and methods" is included in the first semester of final year.	The Engineering graduates who will work on maintenance of varied Construction equipment must be given a few months training on the spot before they can be finally absorbed.				

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2. Banaras Hindu University.

A compulsory subject entitled "Construction Methods" forms a part of the curriculam of final year Civil Engineering students from 1970-71.

The fresh graduates, should be made to undergo one year's practical training in recognized and important Construction Industries using sophisticated equipment and adopting latest methods of construction. The training should be made compulsory before awarding the degree. Every important Project in the country should maintain a record of the unusual difficulties encountered in Construction and how they were overcome, the equipment and methods adopted during the execution. These records would be of immense use and value to fresh graduates.

The present practice of asking the students to undergo training on the job for a couple of months at the end of each academic year, cannot provide him with an integral picture of the project as he is not fully conversant with the fundamentals. To maintain the Construction cost at the minimum it is important to keep specialised personnel on the job.

3. College of Engineering, Madras.

In the final year of B.E. degree course a full paper on the subject of "industrial management" has been introduced which is compulsory for all branches of students.

The students are also taught the principles of Time Motion studies, planning and organising works and plant lay out, plant maintenance, routine and preventive maintenance etc.

4. University of Roor-kee.

The course "Construction and Plant" is taught in this University to the undergraduate students in the Civil Engineering Branch.

A proposal to introduce "Material Handling" to the Mechanical Engineering students is under consideration.

Subjects like (i) Construction
Technique, (ii) Construction
plant and Equipment, (iii)
Planning and Operation, and
(iv) Advanced Construction
Technique are taught in the
post graduate classes.

Better teachings of these construction plants and their operations is possible only with prototype machinery and plant being made available for the study and this can best be served by organising inplant training.



 Sardar Vallabhai Bhai Regional College of Engineering & Technology, Surat. Emphasis is given at B.E. 4th and 5th year Civil course and exhaustive details of common type of equipment used in Civil Engineering Works are covered in the Course.

Besides the inclusion of this subject of Construction Methods and Equipment in the syllabus of under graduate student in Civil Engineering, there should be certain centres giving practical training in operation and handling of such equipment. Even a short term specialised course on "Construction Methods and Equipment" may be organised by teaching institution for practicing engineers of the locality.

6. College of Engineering, Poona. This university has already made provision for three papers in Construction at the undergraquate level. Syllabus also includes subjects on Construction Method and Equipment required for deep foundation, Mechanical and Power appliances and earthmoving machinery. It may be desirable to insist for a post graduate degree for those who are required to be incharge of major projects involving the use of various Construction Equipment.

5 2 3 4 1 As regards weightage to be given to the Construction Methods and Equipment, the college is running a post graduate Course leading to the M.E. degree in Engineering Construction and Management. A practice oriented Course in Construction Planning and Equipment is offered as a compulsory subject at the second semester of the final year of the Civil Engineering, 7. Birla Institute of Technology and Science, Pilani. In general it has been observed that the students find the course quite interesting and informative. degree course. Initially students are introduced to all aspects of Civil Engineering Construction Planning. The later part of the courses meant to introduce to students the construction practices in some major fields, such as earth moving, aggregate and con-crete manufacture, under water and under-ground construction, grouting, erection of girders and highway construction. Various equipment used on those constructions and their working are presented with a specific mention about their selection, which includes cost of owning and operating such equipment, work time-studies and their renewal policies.

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